The Chemical Age

VOL LXVII 15 NOVEMBER 1952 No 1740

Safety First

INDEX TO ADVERTISERS IN THIS ISSUE

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
Telegrams: ALLANGAS FLEET LONDON · Telephone: CENTRAL 3212 (26 lines

Volume LXVII 15 November 1952 Number 1740

More Specialisation?

A RECENT leader in *Industrial and Engineering Chemistry* (1952, **44**, 10, 2265) suggests, albeit tentatively, that the time has come for greater specialisation in scientific and technical training. This view, coming from the United States where technological education is already more developed than here or in the rest of the world, seems a little alarming. Nevertheless it is a view put forward with powerful reasoning. There is no evidence from anthropology or sociology that man's basic intelligence has advanced during the centuries. But the excessive rate of progress in science makes greater and greater demands upon man's intake and understanding and 'there is a limit to the number of facts an individual can absorb, certainly a practical limit imposed by the time available, and probably an intellectual limit based on the volume he can assimilate'. This is suggested as the main reason why existing scientific knowledge is so slowly brought into industrial application. In the United States it is said that progress depends 'just as much on the effective use of present knowledge as on the need for new discovery'. In Britain it was forcefully urged by a former president of the British Association, Sir Henry Tizard, that the general expansion of research was not of first importance in restoring industrial health but 'what is of first importance is to apply what is already known'. Knowledge in the physical sciences accumulates at a rate much faster than it can possibly be applied in industry. Perhaps we shall not be far wrong if we risk the rough generalisation that further progress in the United States depends upon a fifty-fifty ratio of utilising the known and the new, and here, because we have been slower in the past, the ratio is seventy-thirty. If these are sound bearings to take, and if it is true that existing knowledge is left on the shelf because there is too much for individual scientists to absorb, then Britain, far more than America, needs a much greater degree of specialisation in training.

Two new fields that are being advocated in the United States are instrumentology and control system engineering. That is to say—and we must acknowledge indebtedness to the leader in *Industrial and Engineering Chemistry* for this clear and terse comment—it is being argued that technical training may sometimes be more fertile if it is organised around tool functions rather than scientific subjects. We have to consider whether we should train some scientists to be specialists not in chemistry or physics but in methods of measurement, in the uses of the diverse instruments that are actually or poten-

tially existent today. Similarly, we have to consider if we should not train other scientists to be specialists in the mathematical study of complex variables and statistics and ready users of modern computing instruments. This involves a considerable reversal of the present sequence in the education of younger industrial scientists. At present pre-industrial training is based upon the fundamental, time-honoured subjects, those divisions of knowledge which have evolved naturally and obviously. As training progresses, so in most cases the number of subjects studied is reduced and to that extent the final product of the system is a specialist, a chemist, a physicist, a chemical engineer, or an organic chemist.

The capacity to develop expert knowledge of, say, modern instrumentation or up-to-date methods of control system engineering is left to later chance; inasmuch as these may be needed in developing industrial products or processes, it is felt or hoped that the basic pre-training will prove an adequate foundation. Would industry be better served by men less well grounded in fundamental subjects but pre-trained in these selected branches of applied science? Or should we leave it to personal inclination and to the power of necessity to turn graduates more slowly into self-made specialists in the new fields? In either case there is the need for a substantial post-educational effort; for the new type of specialist would hardly be able to make effective contributions to any industry he entered until he had 'picked up' the chemistry and physics of the materials with which he must be concerned, and this process of 'picking up' would have to be based upon a limited training in the main scientific subjects as such.

'If,' says the leader we have quoted, 'we can perceive a route that promises to multiply the potential productivity of our scientists and technologists, we should test it.' We feel we must differ, and for more than one reason. The end and be-all of man, even of scientific man, is not service for industry. To us there seems to be a limit beyond which education should not be specialised to meet the likely needs of material production. A scientist's basic education must satisfy his own needs as well as the demands of organised society. Nor is this only a matter of philosophy. The industrial world has lived for some years in a continuous period of expansion and inflation. What are the prospects of ultra-specialists if and whenever this climate changes? The man trained to be adaptable, to know a good deal about many things, who has, in short, a sound general foundation, is better equipped to preserve his own economy. Nor is this all. If in time we adopt technological systems of education that produce a greater variety of specialists, all development research will depend upon sizeable teams, each member of which exercises defined and refined functions. This may be beneficial to industry, but largely and perhaps only to those huge units of production able to afford the costs.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 35s. Single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited.

Notes & Comments

The Odd 4 Per Cent

THAT voluble minority comprising the Chemical Workers' Union held its 23rd annual general meeting on 27-28 September at a hotel in the precincts of Bloomsbury. This occasion might well have escaped notice had it not been the subject of a report appearing, naturally enough, in its official organ, the *Chemical Worker*. A glance at the resolutions on the agenda of this meeting makes entertaining reading: Resolution 1: Demand for increase in wage rate. Resolution 2: Calling for a more vigorous campaign for a substantial wage increase and intensification of the struggle for recognition on the J.I.C. Resolution 4: Demanding reinstatement of food subsidies. Resolution 12: Requesting abolition of the 1s. charge for medical prescriptions. Resolution 16: Protesting against Government suggestion of raising retiring age to 67. Resolution 18: Protesting against the budgeting policy of the present Government. Resolution 28: Expressing concern at the deterioration (*sic*) of the economic situation, and calling for a Royal Commission to study the facts and propose a long-term solution. Less amusing, perhaps, is Resolution 11, demanding that cuts in the National Health Service should be restored from money now being spent on rearmament; while Resolution 13, urging 'World Peace', with a view to averting another world conflict, 'thus avoiding the tremendous suffering that such a conflict would bring', and Resolution 30—Calling for European Unity—make the three tailors of Tooley Street pale into insignificance. We could perhaps suggest a few resolutions which would appear to have been rather inexplicably omitted from the agenda. Resolution 45: That the secretary write to the Government calling on it to resign immediately. Resolution 46: That the officers of the Chemical Workers' Union form themselves into a Government with the object of solving the nation's economic, industrial, chemical and any other difficulties. After passing these, the CWU could safely return once again to that blissful cloud-cuckoo land from which it makes its annual, but futile, emergence.

Vital Statistics

IT is interesting to record that the CWU had a registered membership at the end of 1951 of 20,056 persons. As the total number of workers in the chemical and allied industries at this time was 489,300, this gives the CWU a total representation of exactly 4.1 per cent. The rest of the workers in the chemical industry belong to various unions, principally the Transport and General Workers' Union, which has strenuously resisted all the efforts of the CWU to gain representation on the Heavy Chemicals Joint Industrial Committee and the Drug and Fine Chemical Joint Committee, with the personal intervention of Mr. Arthur Deakin, who is, of course, severely rebuked in the current *Chemical Worker* for his speech at the last Labour Party Conference at Morecambe. One revealing item of news in the *Chemical Worker* which throws some light on the policy of this paper and the CWU is the bald fact, recorded with an eloquent lack of comment, that the Berlin airlift cost £225,000,000 and 79 lives, for a total population in West Berlin of 2,000,000. On the previous page is an article warning what can happen in a trade union branch which falls under Communist domination. This one article deserves a wider circulation than it evidently receives.

In the Can

THE second centenary of Nicolas Appert occurred last month, but surprisingly little attention was given to it, though the *Encyclopædia Britannica* is not very wide of the mark in saying of Appert's contribution to mankind, 'the method of preserving food in tins or other containers is probably defensible as the greatest of all inventions in historic times.' Appert, an obscure French confectioner and chef, must be ranked with Caxton unless points are awarded more highly for benefactions that appeal to the mind than for

those that appeal to the stomach. Bonaparte gave Appert the French government's prize of 12,000 francs for discovering a means of keeping food fresh over lengthy periods of time. Science may have shared very greatly in the development of the world's vast canning industry that followed Appert's discovery but no claim can be made for any share in Appert's own work. Utterly unguided by scientific knowledge or ideas he found that heat treatment and subsequent airtight sealing kept foods fresh. Bacteriology and explanation was to come later. The first containers used successfully by Appert were glass bottles and jars sealed with wire-tied and hand-cut corks. Appert preserved food in the days of Bonaparte in much the same 'boiling-water' way that British housewives preserved precious summer fruit in the days of Hitler. It was an Englishman who patented the can, a tin-plated iron container that had to be subsequently opened with hammer and chisel onslaught. But the canning industry grew rapidly and the early European emigrants to America took it with them. William Underwood, an Englishman, founded a small cannery in Boston though it is said that he had to rely on sales to the Far East and South America for most of his early business. Probably none of these early pioneers could have imagined the self-heating can of World War II.

Chemists Carry On

AN enormous industry, of great benefit to both eaters and producers of foods, has steadily evolved from its simple start in the kitchen of a humble French chef. Chemistry has played a big part in its steady growth and not only the most obvious branch, metallurgical chemistry. Protective lacquers have been introduced to diminish discoloration and corrosion of the internal tin layer; the specific conditions for preserving different types of food have been accurately determined. In recent years chemistry has had to solve the problems created by the high price and scarcity of tin. But it seems appropriate in 1952 to remember Nicolas Appert who was born in 1752 and to note that pasteurisation existed before Pasteur, whose work in fact merely interpreted a layman's success.

For Dollars Only

A BOOKLET recently published by the well-known American publishers, McGraw-Hill, provides interesting 'break-down' figures of America's export trade in chemicals and chemical plant. The figures should be at least as interesting to British manufacturers as to their home country for all the sales that this trade wholly represents have required dollars. If the economic views of some of General Eisenhower's most vociferous supporters are given political shape in 1953, some of the dollar credits that have stood behind this trade in the past will tend to tighten. Taking both chemicals and plant together, the dollar-volume 1951 figures for different areas of destination are given as follows:

	$ (thousands)	Per cent of total
Latin America	527,155	39.3
Europe	282,034	21.0
Canada	276,483	20.5
Asia	190,134	14.2
Africa	45,286	3.4
Oceanic	21,804	1.6

Practically three-quarters of this trade as a whole is in chemicals, though for each of the geographical divisions this 3:1 ratio for materials and machinery may not hold good.

Greater Sales Expected

THERE is also an analysis of the types of chemicals sold. In 1951 all this trade amounted to almost $1,343,000,000 and it is believed that the current year will show a rise to at least $1,500,000,000. In 1951 the total spent upon plant and machinery of chemical nature was $366,000,000, the main classifications being processing machinery and parts ($77,000,000), reaction equipment ($55,500,000), materials handling equipment ($69,000,000), and liquid and gas handling equipment ($59,000,000). It is expected in the U.S.A. that this total volume of export trade will be increased. If so, there would seem to be plenty of room for Britain's export trade in chemicals as well.

Synthetic Detergents & Sewage Treatment

Experimental Trials at Wolverhampton

SYNTHETIC detergents, although known for a long time, have only in recent years come to be used extensively both in the home and in industry. When it was realised that their common use was likely to become a permanent practice, their composition and properties, differing as they do from soap, naturally aroused the concern of those responsible for purifying sewage and safeguarding the rivers.

Following a meeting at Bradford in 1948, fears were expressed that the growing use of synthetic detergents might lead to many troubles on sewage works and in rivers, the chief of these being:—

1. By forming stable emulsions the synthetics would render primary sedimentation ineffective. This might overload the biological section of the plant and thus cause deterioration in the quality of the final effluent. The proportion of sludge separated in the final, as against the primary, settling tanks might be increased; such an increase in the proportion of secondary sludge might add to the difficulty of dewatering the sludge.

2. At sewage works where acid cracking and grease recovery are practised, the concentration of synthetics might rise to such a level as to diminish seriously the efficiency of the cracking process. The substitution of non-fatty detergents for fatty soaps would also cause a decrease in the amount of grease available for recovery.

3. The activity of biological filters and activated sludge plants might be inhibited, or the plants might be overloaded by the oxygen demand of some synthetics; alternatively, the synthetics might pass through the process unchanged, possibly carrying emulsified impurities with them. In the latter case, besides pollution of the river, there might be unsightliness due to foaming in the stream.

4. Sludge digestion and dewatering might be affected.

Address on Research Work

Investigation of the problem required an immense amount of research and some of the interesting work carried out at two sewage works of the Wolverhampton Corporation was described in an address given by Mr. John Hurley, B.Sc., F.R.I.C., F.Inst.S.P., F.I.San.E., F.R.San.I., manager of the Sewage Disposal Department, County Borough of Wolverhampton, to the Institute of Sewage Purification session of the Public Works and Municipal Services Congress held in London on 7 November.

In his paper entitled 'Some Experimental Work on the Effect of Synthetic Detergents on Sewage Treatment,' from which the following summary is taken, Mr. Hurley dealt with large-scale experiments at the Coven Heath and Barnhurst sewage works.

Types of Synthetic Detergents

Synthetic detergents manufactured in Britain consist mainly of three types:—alkyl sulphates (including primary alkyl sulphates, secondary alkyl sulphates and sulphated monoglycerides); non-ionics; and alkyl aryl sulphonates.

At present the greater part of the detergent tonnage used for industrial purposes consists of alkyl sulphates, but non-ionics are being employed on a considerable scale. For domestic purposes, however, the synthetic detergent powders are based on alkyl aryl sulphonates. It seems likely that, in total consumption, the alkyl aryl sulphonates now take first place, with alkyl sulphates next and non-ionics a fairly close third.

The problem is magnified by the fact that 'synthetic detergent' is not a single substance but a generic term covering a multitude of different proprietary and non-proprietary materials. The composition and properties of these various materials differ enormously, and it is clear that it cannot be assumed that they will all have the same response to, and effect on, sewage purification processes.

It is therefore necessary to recognise that not only will the concentration of synthetic detergent vary from one sewage to another; the relative proportions of several different detergents will also vary from place to place. While it is possible to make at least a rough estimate of the maximum total detergent concentration which may ultimately occur in sewage, it is impossible to feel any confidence in assessing the probable distribution

of this concentration between the various types and blends of detergent now available.

Indeed it is easily possible that within a few years quite different detergents from those now manufactured may dominate the market; as the large-scale production of synthetics is a relatively new industry, it would be foolish to ignore the possibility—even the likelihood—of striking changes and developments.

The principal items covered by the investigations were:—

Section A.—Large-Scale Experiments at Coven Heath Sewage Works.

1. Effect of 'Teepol' on sewage treatment, with filters receiving: (a) their normal dosage of tank effluent; (b) double their normal dosage of tank effluent.

2. Progressive removal of 'Teepol' by filters receiving:—(a) their normal dosage of tank effluent; (b) double their normal dosage of tank effluent.

Section B.—Large-Scale Experiments at Barnhurst Sewage Works.

Investigation on the effects of 'Teepol' on activated sludge (Haworth bio-aeration) treatment.

Operates as Separate Units

The most important characteristic of the Coven Heath plant for purposes of the experiment was that it operates as two separate and identical units. This enabled the southern section to continue dealing with ordinary sewage while the northern section dealt with the same sewage, plus a regulated dose of 'Teepol.'

General deduction from the results of the first four months' run with filters receiving their normal dosage of tank effluent (experiment 1a) was that the addition of 'Teepol' (20 per cent active matter) in amounts up to 7.5 parts per 100,000 had no significant effect on sedimentation, mechanical flocculation, biological filtration or final settlement. There was no trouble from frothing, either on the works or in the small stream receiving the effluents, nor was there any visible difference in appearance between the two halves of the works, operating with and without the addition of 'Teepol,' respectively.

On March 31, 1950, the dosage of 'Teepol' was increased to about 10 parts per 100,000, and this rate was maintained until 9 June. During this period, nine sets of averaged samples were taken. The average 'Teepol' content of the dosed sewage was 13.8 parts per 100,000. The 'Teepol' was almost completely removed during the purification process, the final effluents from the two sections of the plant showing little difference in apparent 'Teepol' content.

There was no important effect on any stage of the treatment process. The 'Teepol' did not give rise to any troubles from frothing or filter ponding, nor was the small stream receiving the effluent adversely affected.

An increase to about 15 parts of 'Teepol' per 100,000 was made on 10 June and maintained until 6 October.

This rate had been fixed as the maximum to be tried during the experiments, as being the highest concentration likely to arise in practice, except possibly in very exceptional circumstances. During the four months at this dosage, ten sets of averaged samples were taken.

Comparisons showed that the effluent from the undosed section of the plant was slightly superior to that from the section to which the 'Teepol' had been added. However, both effluents were of excellent quality.

The 'Teepol' content of the dosed sewage averaged 20.6 parts per 100,000, a figure which seems unlikely to be exceeded in practice, under any but the most abnormal circumstances. No significant quantity of 'Teepol' remained in the final effluent.

Results obtained from trials conducted with filters receiving double their normal dosage of tank effluent (experiment 1b) had been in progress for nearly one year, and had shown that a sewage filtration plant which was 'well up to its job,' could cope with any concentration of 'Teepol' which was likely to arise in practice.

Tests were also made by overloading, that was by cutting out two filters from each section of the Coven Heath sewage works so that the remaining two were more heavily loaded with sewage.

Appearance no Different

At no time during the experiment was there any appreciable difference in appearance between the filters of the two units, working with and without the addition of 'Teepol,' respectively; nor was there any perceptible ill effect on the stream.

Earlier large-scale experiments at Coven Heath had shown that 'Teepol' is readily removed by biological filters. To obtain further information on this point, and other

related matters, it was decided to make arrangements for taking samples from various depths from one of the filters receiving the sewage containing added 'Teepol.' (Experiment 2). Similar intermediate samples were also taken from the corresponding filter of the other unit, receiving ordinary sewage; comparison of the results from the two filters could be expected to show the quantity and effect of 'Teepol' at different stages as the oxidation of the sewage progressed.

The sampling arrangements were the same in each case. Sampling was continuous; each hour a fixed volume of each effluent was poured from the collecting jar into the appropriate 'bulk' sample bottle, the jar being emptied and then replaced.

It was found that the presence of 'Teepol' had not perceptibly retarded purification at any of the depths. It was noticeable that most of the 'Teepol' contained in the filter feed was removed in the top foot of the filter.

Sampling at the intermediate points was also carried out during the 'overloading' experiments, when the dosed section of the plant was receiving 10 parts of added 'Teepol' per 100,000, and the filters in both sections of the plant were treating double their normal quantity of sewage.

Comparison between the normal and overloaded conditions showed that whereas in the former nearly the whole of the 'Teepol' disappeared in the top foot of the filter, in the latter case the same state of removal was not achieved until the sewage had passed about halfway down the bed.

The large-scale experiments on the effect of 'Teepol' on sewage purification by the activated sludge (Haworth Bio-aeration type) process were carried out at the main (Barnhurst) sewage works of Wolverhampton. The sewage there is stronger than at the Coven Heath works.

Four bio-aeration channels (each 250 ft. in length) and one final settling tank were isolated from the rest of the plant. 'Teepol' was added by an arrangement which generally resembled that used in the Coven Heath trials.

Frothing Occurrence

During some preliminary runs it was discovered that frothing occurred when the sludge content of the channels was low, and was quickly cured when the sludge concentration was increased. This phenomenon has since been observed by American operators.

Dosages of 'Teepol' up to 12.5 parts per 100,000 added to the feed to the bio-aeration plant, equivalent to about 16 or 17 parts of 'Teepol' per 100,000 added to the crude sewage, had no appreciable effect on the quality of the effluent. Nor was there any noticeable difference in the amount of foaming on the two sections of the plant; sometimes one section of the plant carried rather more lather than the other, but the difference was not always in the same direction.

Factors other than the presence of 'Teepol'—such as the nature of the sewage and the amount of gas liquor present—seemed to exert a much greater influence on foam production.

Results so far obtained indicated that 'Teepol,' in the concentrations in which it is likely to occur in sewage, will not have any marked effect on sewage purification processes.

The possible effect of 'Teepol' on sludge treatment has not been dealt with as experimental work in progress on this subject at Wolverhampton has not, so far, reached a sufficiently advanced stage to justify definite conclusions.

It is hoped that arrangements will be made to extend the experimental work at Wolverhampton to other types of synthetic detergents. Data and observations arising from investigations on other matters have emphasised that results obtained with 'Teepol' should emphatically not be taken as applying to all types of synthetic detergent.

Mr. Hurley concluded by expressing his appreciation of the ready collaboration of the Shell Co. which provided the 'Teepol,' and paid a tribute to the keen and efficient team work at the Wolverhampton Sewage Disposal Department without which effective execution of the work would not have been possible.

Underground Oil Storage

Considerable interest has been aroused by the Swedish method of storing oil underground, known as the Viaco Cistern (THE CHEMICAL AGE, **65**, 773). Representatives of the Standard Oil Co., New Jersey, are reported to have recently visited Stockholm, to discuss the adoption of this method for an annual storage of 10,000,000 barrels.

A Great American Company

Du Pont Celebrates 150th Anniversary

TO COMMEMORATE the 150th anniversary of its founding, Du Pont de Nemours & Company have published a well-illustrated book on the growth of their company from its inception to the present day. This company started when America, as a nation, started, and the pictures on the pages of this book and the text beside them show vividly how closely the progress of Du Pont has paralleled that of America, and indeed, sometimes been one of the main causes of that progress.

The company started in 1802, when a French refugee from the Revolution, E. I. du Pont de Nemours, built a small mill on the banks of the River Brandywine, near Wilmington, Delaware.

At this time America was a tentative association of a bare 16 states, their independence newly won from England, under the Presidency of Thomas Jefferson. Conditions were hard, but the opportunities were there for men who had the determination to take advantage of them.

Need Fulfilled

One of the primary needs of the country which Du Pont was to fill was reliable gunpowder. French powder was first-rate—thanks to Lavoisier, later guillotined by the Revolutionary Convention—but the American version was very poor, and it was badly needed for protection, for shooting game and getting food, for building roads, and for clearing land and moving rocks and trees in newly settled areas. President Jefferson himself urged Du Pont to set up a factory for making it, and by 1804 the first Du Pont powder was on public sale.

Although it was good powder, however, debts and misfortune made things hard for the company, and it was not until 1834, when E. I. du Pont died at 63, that the company really began to take root.

This great forerunner of 20th century expansion was the first to acknowledge a responsibility towards his employees. After an explosion in 1818 he pensioned for life widows of men killed. He was also the first to plough back a share of the profits when the company did begin to make money. Short-sighted investors who wanted all profits as dividends were eventually bought out, with great hardship, and neither arguments nor inducements modified his continual efforts to increase the quality of his product by improving his methods, and to lower his prices by expanding output.

During the years from 1834-1860, America, thanks largely to the invention of the steam engine, expanded fast. Du Pont's powder helped to blast rights of way for the railroads through mountains, valleys and forests. Invention followed invention. Then came the Civil War, with Du Pont supplying the Federal Government with powder. Chilean nitrate had just been patented by the company as a better and more plentiful substitute for potassium nitrate in black powder, and during the Civil War the company produced for the army and navy an average of 1,000,000 lb. of the new powder a year.

In the tide of expansion after the Civil War the East and West of America met through the expanding railroad. Steam power and growth of the big cities brought a host of inventions to the fore. Probably the most outstanding chemical discovery during this period was dynamite, which changed coal, iron, silver and nickel production overnight, and made possible the manufacture of cement. Du Pont erected a plant on the River Delaware for its manufacture.

A New Powder

A little later Du Pont was asked by the Federal Government to investigate another explosive. For some time there had been hints that in Europe powers were experimenting with a new smokeless powder. Du Pont developed it—based on guncotton—and justified itself by supplying over 40 per cent of the military smokeless powder used by the Allies in World War I.

The present century has seen Du Pont expand into the mammoth organisation it is today. In its own words, this is a blend of many things—people, plant, techniques and technology; finance, research and management; customers, markets and that brand of half inherited, half created quality called enterprise.

Chlorination of Ethyl Alcohol

Studies by Rhode Island State College

CHLORINATION of 95 per cent and absolute ethyl alcohol at various temperatures has recently been studied by the Rhode Island State College, whose investigations have led to the development of a new procedure for the industrial preparation of chloral. The progress of this research is reviewed in a series of reports, which have recently been acquired by the Technical Information and Documents Unit.

Examination of the literature disclosed many references to the preparation of chloral by the chlorination of ethyl alcohol, but the descriptions of procedures were vague and many of them were too ambiguous to be a useful guide. According to one account quoted by the investigators, the chlorination of ethyl alcohol (absolute) is done in three distinct stages, the first being the passage of about one-third of the required chlorine through the absolute ethyl alcohol at a temperature not above 20°C., a similar quantity being added while the temperature is gradually allowed to rise to 50°C., and the balance at 80°-90°C. The total time of addition varies from a minimum of three to a maximum of 10 days. Warning is given that during the first stage of the reaction care must be taken to avoid an explosion caused by the formation of ethyl hypochlorite. Various mechanisms for the numerous possible reactions are postulated, but it is emphasised that absolute alcohol must be used and that any variation in the procedure described causes an appreciable decrease in the yield of chloral.

Chloral Preparation

The investigators found that, contrary to all the classical methods of preparation, chloral could be prepared in 70 per cent yields simply by chlorinating 95 per cent ethyl alcohol at 80-95°C. The quantities of low-boiling and high-boiling fractions were held to a minimum. No advantages were presented by the use of absolute instead of 95 per cent alcohol.

In these experiments the chlorine cylinder was fitted with a needle valve and rested on a counterbalanced sensitive platform scale. The chlorine was metered through a Corning flow meter into a ground glass cylinder containing approximately 350 cc. of ethyl alcohol. The chlorinator consisted of a 500 cc. cylinder with a fretted glass gas disperser and reflux condenser. The effluent gas was bubbled through carbon tetrachloride (to check on the presence of free chlorine) and then into a hydrochloric acid scrubber. The temperature of chlorination was controlled by means of circulating oil or water baths. The entire chlorination took place smoothly and the reaction mixture remained homogenous throughout the experiment. The final product was a clear, yellowish viscous oil with a specific gravity of 1.50-1.55.

It was considered that the new procedure offered three possible advantages. Since the heat of reaction was sufficient to maintain the temperature, expensive jacketed equipment could be replaced by properly insulated tanks. Secondly, actual yields of 70 per cent chloral were possible, and in the third place the rate of chloral production was increased, the time required being reduced to 36 hours.

Accumulation Avoided

By starting the reaction at room temperature, the ethyl hypochlorite formed was completely decomposed, and in this way accumulation of large quantities of this substance was avoided. It was believed that a mixture of ethyl alcohol and HCl gas would not explode, ignite or flare, and none of these difficulties was encountered in any of the reactions. There was a possibility that chlorine gas and alcohol vapour might form an explosive mixture, but the U.S. Bureau of Mines has no information on the inflammability of chlorine-alcohol mixtures. The passage of Cl_2 through the reactors at too high a rate, resulting in the presence of considerable free chlorine gas above the alcohol, might, however, prove dangerous. It should easily be controlled by having a nitrogen or carbon dioxide inlet at the liquid-vapour interface of the reactor, with a thermocouple connected to the valve on the nitrogen or carbon dioxide tank.

From the observations made during the preliminary experiments it proved possible by adjusting the variables to obtain yields exceeding 86 per cent. Exact conditions

for the chlorination of 95 per cent ethyl alcohol for producing an 86 per cent yield of chloral were determined. The laboratory procedure and apparatus used here suggested an inexpensive commercial method of manufacture. On an industrial scale the chlorinated product may be treated with an equal volume of 70-80 per cent sulphuric acid, refluxed and then distilled. However, this procedure will yield a mixture of chloral and chloral hydrate, which will not result if the 96 per cent acid is used. The only reason for using the concentrated acid was to obtain a product consisting of pure chloral and thereby standardising the basis of the yields.

Two Space Velocities

Two space velocities affording the optimum rates of flow were determined in the preliminary experiments, in which a carbon tetrachloride scrubber attached to the system turned a green colour in the presence of chlorine. At the beginning of the reaction the space velocity could be maintained at 90-100, but when about 0.5 mol. of chlorine had been added, it became necessary to reduce the space velocity to 25-30 for the remainder of the experiment.

Quantitative determination of the unreacted chlorine in the exit gases was made with sodium iodide. The exit gases were scrubbed free of the hydrochloric acid and were then bubbled through sodium iodide solution, which was replaced every two to six hours. The results of experiments showed that the chlorine in the exit gases varies from 0 to 3 per cent of the chlorine input per hour until the total chlorine input, based on theoretical requirements, has been reached. The concentration of unreacted chlorine then increases so rapidly that in the final stages of the reaction it reaches 50-60 per cent of the chlorine input per hour. The conditions for these results are:

Molal ratio of chlorine/alcohol	2.51/1.0
Initial space velocity	90-100
Reduced space velocity	25-30
Operating temp.	78-94°C.

The yield of chloral under these conditions was 87 per cent. The presence of ethyl chloride was established quantitatively in the exit gases and its recovery was believed to be commercially feasible. The apparatus used in previous experiments was therefore modified as follows: After the sodium iodide scrubber, a concentrated sulphuric acid scrubber and an acetone/dry ice trap was attached. The exit gases passed through hydrochloric acid scrubbers, a sodium iodide scrubber and a sulphuric acid scrubber, and the remaining ethyl chloride gas condensed in the acetone/dry ice trap. The trap was graduated in such a manner that the volume condensed could be read directly. At the end of each experiment the liquid in the trap was transferred to a precooled pressure bottle.

Relationship between the water content of the alcohol and the yield of chloral was also investigated. The results obtained demonstrate that the maximum yield of chloral is obtained from ethyl alcohol solutions containing from 5 to 10 per cent by weight of water. The presence of a small quantity of water proved to be beneficial to the reaction, but when water was present in quantities greater than 10 per cent by weight, the yield of chloral decreased.

The presence of water in increasing concentration and the decrease in chloral yield might be expected to increase the free Cl_2 in the exit gases. However, the percentage of unreacted chlorine in these gases remained approximately constant from absolute to the 75 per cent, and decreased for the 70 and 65 per cent alcohols. The overall unreacted chlorine was from 7 to 10 per cent of the total input for concentrations of 100-70 per cent alcohol. The exit gases from the 65 per cent alcohol had an overall unreacted chlorine content of less than 5 per cent.

Effect of Solution Concentration

An attempt was also made to determine the effect of the solution concentration on the yield of ethyl chloride and whether the ethyl chloride was formed at the expense of chloral. If the ethyl chloride formed removed ethyl alcohol which would otherwise have been converted to chloral, then an increase in the formation of ethyl chloride should cause a corresponding decrease in the yield of chloral. The results obtained showed that the alcohol consumed in the formation of ethyl chloride had no direct relationship to the yield of chloral.

In another series of experiments absolute ethyl alcohol was progressively chlorinated at three temperature levels, the results being compared with the chlorination at reflux temperatures. The experiments showed that the three-stage chlorination of absolute ethyl alcohol offers no advantage over the single

stage process at reflux temperature, but only certain disadvantages. There is, firstly, the possibility of an explosion arising from the appreciable formation of ethyl hypochlorite in the first stage. A second disadvantage is that the total chlorination time is at least double. In the third place, the formation of ethyl chloride is negligible. The ethyl alcohol combined in the hemiacetal is destroyed in the sulphuric acid distillation, whereas in the one-stage process the hemiacetal is changed to chloral hydrate with the formation of appreciable amounts of ethyl chloride. Recovery of this valuable by-product would decrease the overall cost of the manufacture of chloral.

The photochemical chlorination of 95 per cent by volume ethyl alcohol was studied, the catalytic action of light of various wavelengths from ultra-violet to infra-red on chlorination reaction being examined. A 200-watt clear glass tungsten filament bulb was used as a light source. It was found that the light from this bulb was detrimental to the formation of chloral.

It had previously been reported that chlorination in the presence of iron chloride increased the yield of chloral and ethyl chloride and decreased the reaction time. The investigators therefore studied the catalytic effect of ferric chloride on the new process for the manufacture of chloral. They concluded that the presence of ferric chloride has an adverse effect on the yield of chloral and ethyl chloride when chlorination is carried out at reflux temperatures.

Samples Studied

Samples of chloral produced with chlorine inputs of 0.5, 0.1, 1.5, 2.0 and 2.5 mol. per mol. of ethyl alcohol were studied. Values for refractive index, density, viscosity, distillation range, percentage volumetric split of the crude chlorinated product when treated with concentrated sodium hydroxide solution, and the percentage of product distilled from an 80 per cent sulphuric acid mixture are given in the report. The investigators believe that the density measurements are the best indication of the progress of the reaction and that they can be used as a convenient test for the completion of the chlorination. The final density should be 1.55 $\pm$ 0.05.

The new process developed on a laboratory scale at the Rhode Island State College is believed to have decided advantages over the traditional methods. A pilot plant was operated to see how many of these advantages could be maintained using normal equipment instead of correctly designed gas-liquid reaction plant. The results showed that ordinary industrial equipment is not satisfactory for operating the new process to the best advantage. Recommendations for suitable equipment are therefore made in the report.

India's Food Industries

Problem of Supplying Population

SCIENTISTS have for a long time been warning of the world problem of increasing food supplies on a scale to match the continued rise in populations. The scientists' important task on safeguarding adequate nutrition was, indeed, the subject of the presidential address to the British Association of Sir John Russell, F.R.S., in 1949.

India, with its vast areas and huge population (which at present rate will be doubled in 35 years), is particularly concerned with these problems, and in May, 1951, two symposia on 'Food and Population,' and 'Development of Food Industries in India,' were organised by the Central Food Technological Research Institute, Mysore.

All the papers and discussions during the various sessions, together with the recommendations made by a special committee have now been published in book form, and now provide a useful collection of the views and suggestions of leading industrialists, scientists, and other experts.

In the first part of the volume, which deals with 'Food and Population' it is pointed out that despite the steadily increasing population, the various hydro-electric and irrigation projects sponsored by the Government should yield better results in the future. Immediate steps are, however, necessary to ensure food supplements of different kinds and also to see that subsidiary foods from tubers like tapioca should be encouraged by all suitable means.

The case for demonstrating proper processing techniques is emphasised in the second part devoted to 'Development of Food Industries in India.' The urgent need for technical personnel, if the food industry is to develop along the right lines, is stressed by Dr. A. Sreenivasan, department of chemical technology, Bombay University.

Nobel Prize Awards

Two British Chemists Honoured

TWO British scientists share this year's Nobel Prize for Chemistry, it was announced by the Academy of Science, Stockholm, on 6 November.

The award has been made to DR. ARCHER JOHN PORTER MARTIN, aged 42, of London, and DR. RICHARD LAURENCE MILLINGTON SYNGE, aged 38, of Bucksburn, Aberdeenshire, for their work on a partition chromatography. The prize is reported to be worth 171,134 Swedish crowns (£11,408).

Dr. Martin and Dr. Synge worked together on chemical research at Cambridge University and later at the Wool Industries Research Association's laboratories in Leeds. Dr. Martin is now head of the department of Physical Chemistry at the National Institute for Medical Research, London, and Dr. Synge is a biochemist with the Rowett Research Institute, Bucksburn, Aberdeenshire.

Dr. A. J. P. Martin

Dr. R. L. M. Synge

Professor Arne Tiselius, winner of the Nobel prize for chemistry in 1948, with whom Dr. Synge worked for a time in 1946, pays a tribute in a Swedish journal to British scientists who, he says, 'seem to have a special gift for making great discoveries with small resources.'

This year's award for physics was gained by two Americans for their work in the development of nuclear-magnetic precision measuring. They are PROFESSOR EDWARD PURCELL, aged 40, of Harvard University, and PROFESSOR FELIX BLOCH, aged 47, of Stanford University, California, who was born in Switzerland.

Metal Finishing Institute

New Group Formed

A PERIOD of activity and development was recorded in the annual report (covering sessions 26 and 27) of the Institute of Metal Finishing (incorporating the Electrodepositors' Technical Society) presented at its annual autumn meeting held in Birmingham on 22 October.

As an extension of the activities of the Institute it had been decided by the council to inaugurate an organic finishing group with emphasis on the process side and technology of metal finishing rather than on the chemical side of organic finishing materials. A delegate committee would be appointed in the first instance to organise a conference which would be held as soon as possible.

The inaugural meeting of a new branch, known as the North-West Branch was held in May. In June the Institute held its first meeting in Scotland. Attendance showed that the nucleus of a healthy branch was available, and the formation of a Scottish branch is being considered in the near future.

New Headquarters

Widening activities of the Institute made larger premises for its headquarters necessary, and after considerable search suitable offices had been found at 32 Great Ormond Street, London.

Publications issued during the two sessions had shown a marked increase, even allowing for the special volume published in session 26 to mark the Silver Jubilee of the Electrodepositors Technical Society, and there had been a welcome increase in the number of manuscripts submitted.

Both annual conferences—at Torquay in 1951 and Eastbourne in 1952— had been highly successful.

The only slightly disquieting feature was the loss of members each year. While some percentage must be expected to leave annually due to retirement, reduction of interest in the industry, and so on, wastage was high. In the last session reduction in the nett increase had been halted somewhat as the result of an increase in membership, which now totalled 1,136.

During the sessions 14 new corporate members had been accepted by the council, and the total corporate membership was now 38.

The Analyst in the Plastics Industry

A lecture given by J. Haslam, D.Sc., F.R.I.C., Chief Analyst, I.C.I. Limited, Plastics Division, at the Summer Meeting of the Northern Section of the Society of Public Analysts and other Analytical Chemists held at Llandudno in June 1952

THE task involved in giving this lecture is an onerous one because previous guest lecturers at this meeting have possessed the ability to discuss technical subjects and make them live and interesting both to analysts, and, more important on this occasion, to their wives and friends. At the same time, they have been able to include sufficient technical matter to make the lecture worthwhile.

For good or for evil, therefore, it was decided that it might be best if an attempt was made to describe some features of the work of the analyst in the plastics industry without getting very technical about it; if the need for that arises this lecture might be supplemented on other occasions.

In the first place it might be useful to consider what this plastics industry is all about. If we seek a definition of a plastic we do not get very far because it tells us 'The term plastic is applied to anything which possesses plasticity, that is, anything which can be deformed under mechanical stress without losing its coherence and is able to keep the new form given it.' Another definition (A.S.T.M.) would be 'A plastic is any one of a large and varied group of materials which consists of, or contains as an essential ingredient, an organic substance of large molecular weight and which, while solid in the finished state, at some stage in its manufacture has been or can be formed (cast, calendered, extruded, moulded, etc.) into various shapes by flow—usually through the application singly or together of heat and pressure.' They may sound very learned but they are not very informative and, if we use them, there is sure to be some kind soul trying to find an exception to them.

Definition of Terms

Perhaps we shall be on firmer ground if we forget the definitions for the time being and concentrate on the things the plastic industry busies itself with. Maybe the best impression of that might be given by indicating the terms one heard most on joining the industry some six years ago. There seemed to be about seven basic terms which everyone used, from managing director down to laboratory assistant, they were:—monomer; polymer or resin; plasticiser; stabiliser; lubricant; pigment; and filler.

The essential feature of all plastic materials is the polymer or resin and it should be realised that it is a complex substance produced from a simple substance known as monomer. As the chemist puts it, the monomer is a simple molecule, the polymer is obtained by the union of many (hence the term 'poly') of these simple molecules, often in a very regular way.

The simple monomers or basic units are usually liquids or gases or liquids which boil at low temperature and it might be useful to consider what happens when a sheet of the familiar polymer 'Perspex' is prepared.

Monomer Starting Point

The starting point is the monomer, a simple liquid of characteristic odour known as methyl methacrylate, and the successive stages in the preparation of the clear sheet of 'Perspex' are as follows: thickening or syrup preparation, evacuation; filtration; cell pouring; polymerisation, stripping with production of the sheet polymer. That is how a sheet of the polymer 'Perspex' is obtained.

It will probably be realised that a large number of manipulative operations are involved and one never ceases to marvel at the great skill exercised by the workers in this process, because they have often had to adapt themselves from previous work in quite different walks of life.

And now the other terms which were mentioned in the first place must be brought in, i.e., the plasticiser, the pigment, the stabiliser, the lubricant, and the filler. These may be illustrated by reference to the preparation of a polyvinyl chloride preparation which might find useful application as an article of rainwear. This time the starting point is the polymer polyvinyl chloride which is in the form of a fine white powder. Of itself, it would not be very useful for our particular purpose, and means have to be found of incorporating:

(a) A plasticiser, which makes the material workable;

(b) A stabiliser, which prevents the polymer from suffering unduly the effect of, in this case, heat. In other cases we may be more concerned about the effect of light and use a light stabiliser;

(c) A pigment, to give the preparation colour;

d) A lubricant, to prevent the preparation sticking in processing, and possibly—

(e) A filler, which will often have a pronounced effect on the physical strength of the finished material.

Kinds of Article

One example has been given of the preparation of a polymer, and another of the preparation from a polymer of what might be described as a polymer composition, and the analyst in the plastics industry is concerned with many such polymers and polymer compositions. Attention might be drawn at this stage to the kinds of article he might meet and be asked to express opinions about in connection with the various plastic materials.

Casein—handles of many kinds, e.g., umbrella handles, knitting needles, handles for manicure sets, buttons.

Cellulose Acetate—coverings for steering wheels, camera cases, film spools, spectacle frames, cigarette boxes

Polystyrene—medicine vials, refrigerator liners, cosmetic containers, cutlery handles, lenses.

Polythene or 'Alkathene'—'Alkathene' tube for cold water plumbing, 'Crinothene' lamp shades, 'Alkathene' film used as a packaging material, containers for corrosive liquids.

Nylon—in monofilament form for brushes, surgical sutures, fishing lines, cable sheathing, nylon film for medical use.

Polyvinyl chloride—garments for rainwear, leathercloth, tubes, sheets, straps and belts.

Polymethyl methacrylate—lenses, corrugated roofing, artificial dentures, sink wash basins, telephone instruments.

Polytetrafluoroethylene—insulating tape, etc., tubing and pipe used in electrical industries.

Urea formaldehyde—as adhesives in the manufacture of furniture and hence liable to be sent to the analyst for the identification of the glue line, decorative sheet material, beakers, etc.

Derivatives of Cellulose such as Methyl Ethyl Cellulose— as emulsifying and thickening agents in catering trades.

Nitrocellulose—in lacquers.

Phenol and cresol formaldehyde—mouldings of all descriptions, e.g., radio cabinets, etc.

Vinylite—uppers and soles of shoes, raincoats, handbags, wire and cable insulation.

Some idea of the finished articles with which the analyst may have to deal has been given, but in order to present a true picture of his work, his place in the industry must be indicated. His position is not unlike that of other analysts in other industries, but the industry in which he is engaged is probably quite different from many other chemical industries because about it there always seems to me to be an atmosphere of life and change and movement with a lot of very young people making mistakes (and discoveries), and a lot of older people trying to stop them.

He will, I think, find himself in a Research Department which may seem puzzling at first sight. In my view it is right and proper that he should be there, because that position will have many advantages for him. It will make it easier for him to bring the Research attitude to mind into his analytical work because, unless he is continuously engaged in the improvement of his analytical methods, his analytical work will surely lag behind.

Physical Division

Alongside his own department he may find, for example, a chemical division which is engaged in the production of new monomers, polymers, stabilisers, lubricants, and so on and moreover, how these substances work. He will probably find a Physical Division dealing with the physical properties of the various polymers and compositions, i.e. obtaining evidence of their physical strength and their electrical properties.

Again he will have to deal with a Fabrication Division studying the manipulation of the various plastics into the forms met in practice, e.g., in the preparation of film, or rod and so on.

He is likely to come into contact with a Process Division engaged in the study of the large-scale manufacture of polymers his

company are interested in. Again, another set of people will be concerned with the fundamental chemical and physical structure of the various polymers and all these people will be working alongside him.

Because of the fundamental nature of their work they will, quite naturally, tend to be always changing, always one of the first places into which new graduates are brought on introduction to his firm.

That will be a good thing for our analyst, because these young minds will keep him alive and, if he is wise, he will welcome all their queries.

In practice, he will find as a rule he has two sets of customers: (*a*) young graduates with a great fund of theoretical knowledge and little practical experience in support, and (*b*) old experienced hands, full of practical experience but perhaps spending a lot of time carrying out the wrong experiment for the wrong reasons because of insufficient theoretical background.

He may find it useful to have available the following motto in his dealings with the two types:—The theory guides, the experiment decides. He will probably find it useful to have one for his own staff, running as follows:—Our England is a garden, but such gardens are not made by singing, Oh how beautiful and sitting in the shade.

So much for the relations of our analyst with his own Division. He will, of course, have to bear in mind that there are other Departments or Division in the organisation to which he belongs and he should know how he stands in relation to them.

Administrative Share

No comment need be made on the administrative services of various kinds, they are very necessary to him, but he will get his fair share whatever the quality of his analytical work.

There are the various sales services, home and export, and he will receive, from members of these services, interesting samples from both home and abroad. The salesman, paying a visit to the Continent, say, is liable to meet a new plastic material with new uses or possibilities. After a preliminary burning test, usually with unsatsfactory results, this type of sample finds its way to the analyst and gives him an opportunity of extending his experience.

He will get work in connection with patents. Some kind soul in a remote part of the world may be making a preparation in a way which appears to contravene one of his Company's patents, and analytical information of various kinds will often play a part in deciding whether that is the case.

And now we are gradually coming to those sections of his organisations which have a close bearing on his work. For this purpose Safety and Medical will be grouped together. Most chemical and chemical preparations can only be made by the exercise of precautions and the extent of those precautions will, more often than not, be governed by analytical tests. One or two examples are given to illustrate the point.

Safe Limits

In the manufacture of polymethyl methacrylate his medical officer will lay down limits for the concentration of methyl methacrylate in the atmosphere at many parts of the plant. The particular concentration my own colleague has in mind is that which is indicative of a satisfactory general condition in the atmosphere of a plant. That means that the analyst will be called upon to devise and carry out rapid determinations of this constituent.

Correspondingly, he will have to make quick and accurate tests for formaldehyde in the atmosphere of a plant making phenol formaldehyde or urea formaldehyde resins. He may be called upon to make observations on what happens when, for example, polytetrafluoroethylene is worked. Correspondingly, the medical officer may insist that the atmosphere in a glass blowing shop, where mercury may be spilt, has no more than a certain proportion of mercury in it, and it is on the advice of the analyst that the medical officer will act in connection with the improvement of ventilation.

The analyst may find himself engaged in the analytical control of the manufacture, for example, of a comparatively new plastic material such as polymethyl α-chloroacrylate.[1] This substance, not far removed from 'Perspex' in its chemical composition, but of much higher softening point, is made from a monomer known as methyl α-chloroacrylate. This substance is a dangerous lachrymator and the analyst will once again be called upon to detect and determine this substance by very simple rapid methods.

In this connection, the analyst will find himself linked up with the Safety Officer, who will insist, and rightly so, that the gas

masks used on the plant handling such a chemical are not tested with chlorine gas, but with the lachrymator itself, and the analyst will be called upon by the Safety Officer to give and, if necessary, demonstrate the test methods of detection of the lachrymator to the company manufacturing the gas masks.

Service and Development

And now we come to a department of his company with which our analyst will find himself in very friendly collaboration, and that is the Technical Service and Development Department. That department has two main functions, to give technical service with existing products and to develop new materials and methods of processing. Its staff includes chemists, physicists, engineers, and plastics technologists, working in well equipped plastics laboratories. Some idea of the technical quality of the men in this section with whom our analyst will have to deal (I am betraying no secrets because this information is available in our technical literature) may be gauged from the fact that out of a staff of over 100, no fewer than 44 are of Technical Officer, or shall we say, graduate, grade.

This Section provides a most practical and useful service to customers, advising them on the correct use of materials, recommending the best type of designs and finding the answers to many technical questions.

On the development side, not only is experimental work on new applications undertaken, but also the evaluation of new products and their modification to meet the requirements of customers.

Technical Service and Development Department supplements the work of Sales Departments. As has been indicated previously the analyst will have to work in close conjunction with this department, helping them, helping customers and helping himself because the problems he will have to tackle will stimulate him and prove to be a fruitful source of analytical ideas.

The analyst will have to maintain a very close contact indeed with the production side of the industry. This Production Department will be engaged in the day-to-day production of polymers and polymer compositions both old and new. All the raw materials will be subject to rigid control, and the analyst will have to give technical guidance in the exercise of control over the raw materials, that is, in the working out of practical specifications for all the kinds of materials I have outlined, for example, monomer, polymer, plasticiser, filler, and so on. He will have to exercise a close check on all the process tests which may be used, including tests on the finished material and he will find himself acting as referee in disputes which may arise between a works analytical department and an outside supplier.

Some idea may be given of the actual day-to-day problems by outlining some of the problems which may arise—indeed, have arisen—at random. A sample of 'Perspex' which exhibited a peculiar pearlescent effect was submitted for examination and the analyst was called upon to express an opinion about the composition of the active agent. That proved to be fairly easy because the 'Perspex' could be dissolved in acetone to yield an insoluble residue which was readily identified as lead pyrophosphate.

Another day he is called in to investigate the cause of an accident which results in a chemist suffering from severe burns and shock ending up in hospital. He goes along and finds that the chemist has been heating together trichlorethylene, sulphuric acid, formaldehyde and methanol. He has been heating these four chemicals together day after day for weeks without the slightest trouble, but on this particular day the reaction has got quite out of control with almost fatal results. He is assured that all the chemicals are the same, but our analyst gets round and eventually lays his hand on some formaldehyde which has been used. He finds that this has been drawn from the plant and he interviews responsible men who assure him that there is little chance of error, but our analyst proceeds further. He is able to prove that that sample of formaldehyde, the cause of all the trouble, contained 2 per cent of phenol due to the fact that a phenol line had not been completely cleared before the formaldehyde sample was taken.

Catalyst Analysed

Many artificial denture plates are made by a moulding process carried out at a temperature of approximately 100°C. We are suddenly confronted with a new method which is carried out in the cold. A catalyst is used and our analysis shows quite conclusively that this is N-dimethyl *p*-toluidine.

Then again we are asked to help a biochemist who is engaged in the determination of protein in cerebro-spinal fluid. Normally he precipitates the protein with sulphosalicylic acid and matches the turbidity with standards prepared so as to contain known amounts of formazin in gelatin. These latter gelatin standards are unsatisfactory; they turn yellow and liquefy and he asks us whether we can prepare rods of turbid 'Perspex.' We prepare such rods and find that these are very useful indeed for the purpose.[2,3] We find they have other uses, i.e., in the determination of bacterial growth and in the standardisation of turbidimetric apparatus. We have in fact had inquiries from all over the globe about this particular application; though not seriously, it has often been hinted in the laboratory that we ought to abandon analysis and set up in the production line.

On another occasion we have to deal with the identification of a particular glue line in a sample of plywood. We are anxious to find out whether that wood had been bonded by an adhesive such as is ordinary manufactured by our firm, i.e., a P.F. or U.F. adhesive. We solved the problem by softening the wood, taking a section with a microtome, and then staining.[4]

'Alkathene' tube, when used outdoors, or when the material is directly exposed to sunlight, and particularly so in very hot climates, suffers change, and in those conditions it is desirable to use black tubing, which is made black by the incorporation of about 2 per cent of carbon black. That meant another method from the analyst; a simple dispersion process which has worked quite well in practice.

Ink Analysis

In many cases ordinary printing inks are not suitable for use with plastic material and special ones have to be devised. The analysis of this kind of substance may be rather difficult, e.g., a particular sample contained:—

Polymethyl methacrylate	19%
Titanium dioxide	24%
Solvent	57%

This solvent consisted of a mixture of:—

Methyl ethyl ketone	18%
Ethyl cellusolve	28%
Xylene	3½%
Methyl cyclohexanone	34%
Dibutyl phthalate	16%

Another problem concerned a sample of 'Perspex' which, although it could be ignited, proved to be self-extinguishing. It was shown that this sample contained an organic phosphate.

In another case the analyst may be dealing with the new fibre 'Terylene' and, in the spinning process, in order to manipulate the fibre, so-called spin finish has to be applied. It is the analyst's job to determine the proportion of spin finish in order that the best working conditions may be obtained.

A Hoax

Not all queries are genuine. It was suggested that a piece of rubber-like wood might contain some plastic material but the correct explanation was that the wood had been made plastic by steaming and compressing heavily in the longitudinal direction.

Again a claim was made by an individual that he could differentiate the various grades of polythene by their behaviour under the U.V. lamp. It was shown that he had been a bit lucky with the particular samples he held, because his claims were not borne out by the examination of many samples of the different grades.

Other problems concerned, for example, the identification of the finish on an 'Alkathene' toothpaste tube, shown to be a glyptal, the identification of a surface coating which might contain urea formaldehyde, thiourea formaldehyde and melamine formaldehyde, the nature of a polymethyl methacrylate type polymer impervious to X-rays, which was shown to be due to the inclusion of an organic bromide compound; the nature of an article of furniture, shown to be a phenol-formaldehyde resin; the assessment of the transport hazards of the products of his company; polymer fume fever, associated with the working of polytetrafluoroethylene; information whether the kaolin in a PVC powder composition was added with the plasticiser or afterwards; information on the shapes and the proportions of various sizes in a polymer powder; examination of sheets of polymethyl α-chloroacrylate; the examination of a nylon yarn in order to determine whether it was 100 per cent nylon 6: 6; the presence or otherwise of sebacates in a film of 'Terylene.'

Finally, it may be useful to indicate some of the basic methods which may be made use of in the examination of polymers and polymer compositions, in particular as they

concern nylon, polymethyl methacrylate and polyvinyl chloride compositions. These are:—

1. In the case of nylon, the method of chemical attack on the polymer molecule, this time with hydrochloric acid, and the identification and determination of the hydrochloride and hydrolysis products[5,6,7]

2. With polymethyl methacrylate, the vacuum depolymerisation of the polymer, with production of monomer, and examination of that monomer.[8]

3. In the case of polyvinyl chloride compositions, the preliminary isolation of the polymer itself, prior to identification, by solution in one solvent tetrahydrofuran and precipitation by a non-solvent alcohol.[9]

4. The interdependence throughout, whether dealing with polymers, polymer compositions or plasticisers, of evidence obtained by both chemical and physical methods of test, and, in the latter case, particularly by use of infra-red spectra.[10]

REFERENCES

1 J. Haslam and S. M. A. Whettem, *Analyst*, **76**, 628 (1951).
2 J. Haslam and D. C. M. Squirrell, *Biochem. J.*, **48**, 48 (1951).
3 E. J. King, *Biochem. J.*, **48**, 50 (1951).
4 B. J. Rendle and G. L. Franklin, *J.S.C.I.*, Jan. 1943, 11.
5 M. Clasper and J. Haslam, *Analyst*, **74**, 224 (1949).
6 J. Haslam and M. Clasper, *Analyst*, **76**, 33 (1951).
7 J. Haslam and M. Clasper, *Analyst*, **75**, 688 (1950).
8 J. Haslam and W. W. Soppet, *Analyst*, **75**, 63 (1950).
9 J. Haslam and G. Newlands, *J.S.C.I.*, **69**, 103 (1950).
10 J. Haslam, W. W. Soppet and H. A. Willis, *J. Appl. Chem.*, **1**, 112 (1951).

New Laboratories Opened

OPENING the extensions to its laboratories and the receipt of new items of equipment from America were among the major events of the year 1951-52 recorded by the council of the British Cast Iron Research Association, Alvechurch, Birmingham, in it 31st annual report.

New chemical and spectrographic laboratories, sand testing laboratories, and extended accommodation for the Development Department, Operational Research Team and Foundry Atmospheres Team, were included in the extensions which were officially opened by the president, Dr. J. E. Hurst, on 2 July, 1952.

When the United Kingdom was receiving Marshall Aid from U.S.A., the association requested some apparatus that was available only in America. As a result of this request, a Perkin-Elmer flame photometer, a dietert dilatometer, an A.R.L. quantometer, and a grating spectrograph were delivered at Alvechurch during the past year. The flame photometer was expected to be helpful in the quantitative analysis of elements estimation of which was not possible by other means. The dilatometer is a machine for testing moulding sands at elevated temperatures.

An elaborate electronic and photo-electric system is embodied in the quantometer, operating in conjunction with a diffraction grating spectrometer capable of giving a direct reading in graphical form. Estimations of elements selected for analysis can be obtained within about 60 seconds of the sparking of the sample. The instrument is arranged to cover some 12 elements in various ranges, including carbon and phosphorus.

These two latter elements are, of course, not normally susceptible to spectrographic estimation and if success was achieved in estimating them by this means, only sulphur, of the elements normally required for cast iron, would remain outside the range of the instrument.

The 2 m. grating spectograph would augment the quartz spectrograph for elements other than those for which the quantometer was arranged.

In the Research Department chemical methods for the determination of very small amounts of lead, antimony, and bismuth had been developed to meet the requirements of the work on nodular cast irons. Much co-operative work had also been carried out on the standardisation of chemical analytical techniques.

For the programme of work on mechanical properties six fatigue-testing machines had been constructed in the association's workshops and were being used to study the influence of silicon content on the notch-sensitivity of nodular cast iron. An extensive investigation of the impact properties of cast iron was in hand.

Erinoid Ltd.

A net loss of £19,000 in the year ended 31 July, 1952, was incurred by Erinoid, Ltd., in comparison with a profit of £69,000 the previous year. No payment will be made to ordinary holders, as against the 12½ per cent (less tax) for 1950-1951).

New Lighting Research Block

Benjamin Electric Keeps Abreast

MANY years ago The Benjamin Electric, Ltd., installed and equipped one of the first commercial photometric and illumination laboratories. Due mainly to the change in the art of lighting, the development of new light sources, and the need for greater facilities and more space, the company recently decided to build a new engineering and research block to house its design and laboratory staff. This new Benjamin Scientific Research Establishment was completed a short while ago and is now said to be the most up-to-date and completely equipped laboratory of its kind. A large number of representatives from the technical Press visited the laboratories and works on 6 November.

The primary function of the department is to develop lighting fittings and lighting technique for industry. In addition to research and development work, a constant check is maintained by the laboratory staff on the optical and physical quality of the reflectors produced in the works. It is essential, therefore, that it should be in a position to make all measurements in the physical, optical and mechanical fields, and to be able to assess the advantages and merits of the company's development work.

The new building consists of engineering, administrative and design offices, a prototype workshop and stores, the main laboratory area of 2,000 sq. ft. and a ceiling height of 22 ft., and sundry smaller laboratory test rooms of a specialised nature.

The offices house all the technical files and data and a library of reference and text books.

Samples of prototypes of new designs are made up in the workshop and are held ready to be tested in the laboratory for illumination and electrical characteristics. The range varies from the smallest local reflector to the largest tungsten fitting, fluorescent trough or floodlight, and all their relevant lampholders and components.

An impressive switchboard provides both A.C. and D.C. supplies to all parts of the laboratories, and transformers give a range of voltages.

The main laboratory is equipped with photometers of various types for measuring light distributions and intensities, for the calibration of lamps and meters. Perhaps the most impressive piece of apparatus is the large Photometric Integrating Sphere, 12 ft. in diameter and weighing two tons, having a perfect white inner reflecting surface.

The laboratory floor is divided accurately into 3 foot squares, and travelling gantries on the ceiling span the whole of this area, so that a number of test fittings can be suspended at any spacing and any mounting height, and their resulting illumination measured at any point.

The main laboratory area, showing three high bay units prepared for test

Chemical Labour Overseas

Earnings & Working Hours Compared

RATES of pay and working hours in the chemical industries of France, Germany and Italy are summarised in a survey of 'Labour Overseas' contained in the October issue of the *Ministry of Labour Gazette* (Vol. LX, No. 10).

An inquiry into economic activity and conditions of employment is carried out at quarterly intervals by the French Ministry of Labour and Social Security. The latest available report relates to 1 April, 1952, and gives the average hourly rates of wages of industrial workers.

Returns were obtained by the Ministry's Labour Inspection organisation from 26,000 undertakings each having at least 10 wage earners and employing an aggregate of about 3,500,000 workers or approximately 58 per cent of the staff of all undertakings in the industrial groups covered by the inquiry.

The chemicals and rubber group showed the following average hourly rates of wages (Francs 988 = £1): Men unskilled 2s. 3d.; semi-skilled 2s. 7d.; skilled 2s. 10d. Women unskilled 2s.; semi-skilled 2s. 5d.; skilled 2s. 8d.

A survey of earnings and hours in the principal industries in the Federal Area is carried out at quarterly intervals by the German Federal Statistical Office. The latest available results are from a survey carried out in February, 1952, and relates to industrial workers only. The earnings quoted are gross earning before the deductions of taxes and so on.

Average weekly earnings and average weekly hours worked in the chemical industry were given as follows (Deutsche marks 11.76 = £1): Men 147s. 6d., 49 hours; women 84s. 6d., 44.6 hours.

In Italy, the figures based upon data collected by the Provincial Labour Offices, represent the gross minimum rate wages for unmarried workers, for a day of eight hours, inclusive of cost of living and before the deduction of statutory dues for which the workers are liable.

Rates of wages are augmented in the case of married workers by family allowances which, up to 16 June, 1952, were at the rate of 68 lire a day for a wife, and 115 lire a day for each child, and from 16 June, 1952, onwards 100 lire a day for a wife, and 153 lire a day for each child.

Ranges of the gross minimum daily rates of wages in the Italian provinces for the chemical industries, as fixed by agreement at the end of June, 1952 (Lire 1,749 = £1) were given as follows:—

Men: highly skilled 9s. 6d.-15s. 8d.; skilled 9s. 1d.-14s.; specialised labourer 8s. 10d.-11s. 5d.; other labourers 8s. 8d.-12s. 8d. Women: 8s. 4d.-12s. 1d.

Sulphur Shortage Ended

A GENERAL improvement in the world supply of raw materials is reflected in the easing of the sulphur position which had such widespread repercussions at the beginning of 1951. Progress, indeed, has been so satisfactory that all Government restrictions and inventory controls have now been lifted in the U.S.A.

In a statement issued in New York on 5 November by the Freeport Sulphur Company, one of the leading producers (for which F. W. Berk & Co., Ltd., act as sellers in the U.K.), it was stated by the president Langbourne M. Williams, Jr., that U.S. Government estimates now showed U.S. supply of sulphur in all forms exceeding consumption by 434,000 long tons in 1952, and 363,000 tons in 1953. Supply in 1952 was placed at 6,524,000 tons against consumption plus exports of 6,090,000 tons and in 1953 at 7,000,000 tons against 6,637,000 tons. Of this supply, four-fifths was brimstone mined from Gulf Coast salt dome deposits.

Referring to the removal of controls as an important step to the return of free economy, Mr. Williams said that this had been made possible by good teamwork between the Government and industry in the national interest.

A form of sulphur rationing still exists in the U.K., but restrictions have been progressively eased and on the whole it can be said that no consumer is being kept short.

Anglo-Canadian Atomic Energy Talks

A review of Canadian and United Kingdom technical policies on atomic energy matters of common interest was considered at a conference held at the Atomic Energy Research Establishment, Harwell, on 7 and 8 November. The Canadian delegates had an opportunity to visit the atomic energy production establishments beforehand.

PHOSPHORIC ACID, PHOSPHATES AND PHOSPHATE FERTILISERS. By W. H. Waggamann. Second edition. Reinhold Publishing Corporation, New York. Chapman and Hall, Ltd., London. 1952. Pp. vii + 683. 120s.

During the twenty-five years that have elapsed since the appearance of the first edition of this book considerable advances have been made in the manufacture of phosphorus, phosphoric acid and phosphates. It has therefore been necessary in the preparation of this second edition to expand and largely rewrite most of the original chapters. At the same time the assistance of several collaborators has been obtained in the completion of this task. The book is intended to form a standard work of reference for all those engaged in the use, application or manufacture of phosphate compounds. The reviewer feels that for these workers this book will constitute an invaluable source of information on phosphoric acid and phosphates.

After a short introductory chapter an account is given of the rôle of phosphoric acid in animal and plant life. This is followed by a description of the various natural sources of phosphoric acid and their classification. The mining of Florida hard rock and pebble phosphate deposits, and of phosphate deposits in Tennessee and other parts of the United States, and in countries outside the U.S.A., is discussed in considerable detail. A further large section of the book deals with the manufacture of phosphorus and phosphoric acid (including its purification), and the production of superphosphates and other phosphatic fertilisers. Phosphate compounds are widely used in baking powders and leavening agents, in water-softening and cleansing products, for preventing corrosion of metals, particularly iron, in the manufacture and refining of cane sugar, and in the flameproofing of wood and textile fabrics. The reader will find much valuable information on all these applications. An appendix is provided which gives details of methods for the analysis of phosphates and phosphatic fertilisers, and a very extensive list of United States patents. These refer to the treatment of phosphate rock, the manufacture of phosphorus, phosphoric acid and superphosphates, the manufacture and use of phosphates in water-softeners and detergent products, phosphate coatings for metal surfaces, and phosphate flameproofing products.—G. S. EGERTON.

PRACTICAL ORGANIC CHEMISTRY. By F. G. Mann and B. C. Saunders. Third Edition. Longmans, Green & Co., London. 1952. Pp. 466. 18s.

This reviewer has possessed a copy of the second edition of this book since its publication in 1938, and apart from the descriptions of organic preparations, has never found it to be of any great use. While the section dealing with the identification of organic compounds was excellent as an introduction to the subject, after the first term or so the strictly limited selection of compounds and their characteristics made it necessary to use a supplementary book. This made him wish that the authors had extended this section and decreased the space allotted to the quantitative aspects of organic analysis. Almost a quarter of the space was devoted to a description of these methods, methods which a student for the general degree, for whom the book was written, has very little chance of meeting except upon his theoretical examination paper.

With these criticisms in mind it is of the greatest interest to examine the new edition which has been extensively revised. Some 50 extra pages have been added, but the qualitative analytical section has not been substantially enlarged. The section upon quantitative analysis on the macro scale has been compressed, but there is now a further section dealing with semi-micro methods. This is an innovation that must be welcomed unreservedly as the older macro methods have been almost entirely superseded. Even so it is doubtful whether the student of

chemistry, already coping with an ever enlarging syllabus, will find time to carry out more than one or two determinations, and certainly will never be given the opportunity to master the technique.

The chapter containing the descriptions of organic preparations has been enlarged to include some of the newer and more important reactions. There is now an excellent selection which serves to give the student laboratory experience of those reactions which are so frequently only known as a name in a theoretical text book. The selection of the examples illustrating the reactions has been particularly skilful.

It seems the more unfortunate, therefore, that no great attempt has been made to extend and revise the section dealing with the identification of organic compounds, which is, as in the previous edition, the weakest part of the book.

In the preface to the third edition it is claimed that the book now caters for the needs of students for the honours degree, and although this claim is not repeated in the introduction, where its suitability for a number of other courses is discussed, both suggest that the book is adequate for work up to a pass Degree standard. In view of the very small number of compounds described this would indicate a very low standard of practical work. There are, for instance, only three ketones whose characteristics are given fully, acetone, acetophenone, and benzophenone; cyclohexanone is not mentioned, although oddly enough, cyclohexanol appears among the alcohols. Similarly, fural is omitted from the aldehydes while pyridine and quinoline appear as heterocyclic bases.

The arrangement of the material in this section, designed as it is to teach the student the maximum amount of organic chemistry, lacks that element of conciseness and directness which make a book of this type invaluable in the practical examination room. While there is an admitted risk that the duller student will use such tables without imagination, and solve his problems in a mechanical manner, the reviewer is convinced that the most satisfactory arrangement for organic analysis is a description of individual tests followed by tables based upon the results of the elements test and containing the compounds in order of melting point. Other tests and the melting points of suitable derivatives should be given at the side of each compound. A further feature which would be useful is an extended treatment of the separation of simple mixtures of organic compounds.

A short section describing organic preparative work upon the semi-micro-scale has been added. This is particularly well written and reflects the general tendency of research workers to carry out experiments upon a much reduced scale compared with some years ago. Where expense is not the primary consideration much of the apparatus illustrated could be improved by the use of small ground glass joints. The use of small apparatus and small quantities of reagents can lead to great savings both of space and money in the teaching laboratory, but exclusive concentration upon this scale can lead students into difficulties when they face large-scale preparations for the first time. It is advisable, therefore, to teach manipulation on the larger scale in addition, and the first section of the book is an excellent introduction and guide to the subject.—J.R.M.

Aids to Organic Chemistry. By Ian Leslie. Fourth edition. Baillière, Tindall and Cox, London, 1952. Pp. 144. 5s.

This neat little booklet does not pretend to be, and is not, anything more than a skeletal memoire containing the barest facts of organic chemistry. The author of the fourth edition, Dr. Ian Leslie, states that he hopes the book will be most convenient before examinations for revision—biochemical examinations being the ones he has in mind—and the book is written with special reference to the future study of biochemistry.

The choice and arrangement of material in the book are, on the whole, good. The entries are concise, in note-form, and easily memorisable. Some rather odd omissions are encountered, however—even for a biochemist—and the space devoted to aliphatic products (90 pages) is almost twice that given to aromatic compounds and natural products (50 pages), which last attempts to deal rather breathlessly with steroids, purines and proteins, as well as benzene, pyrrole and pyridine and their derivatives. Some of the more important compounds of which there is not a trace are the natural pigments, haemoglobin, anthocyanins, carotenoids; naphthalene, anthracene; and, more especi-

ally, the vitamins (with the sole exception of vitamin D). Although purines are sketched, their relations to the enzymes and nucleic acids—the main reason for their interest to chemistry and biochemistry—are not given.

In general, Dr. Leslie seems to have treated the aromatic and more advanced side of organic chemistry very perfunctorily. The nitration of benzene is not carried out in practice by nitric acid alone, either in the laboratory or industry, and it is misleading to say that it is. Quinoline is dismissed in 1½ lines, without its synthesis being given; quinone similarly. No general *methods* of synthesis are given. The structures of urea as given are wildly out of date. Proportion also seems to be lacking—carbohydrates being accorded 16 pages, without, however, any mention of Fischer's work or vitamin C —while the whole heterocyclic field including pyridine, pyrrole, indole and the purines, receive only nine pages. The book might well have curtailed its scope in the more advanced field. Natural products have such a complicated chemistry surrounding them that the mere presentation of their structural formulae with a few lines of explanation—as is done with the hormones—is unlikely to be of much value in revision or anything else. The aliphatic section, however, should be a real help, and the list of practical tests at the end should also be useful.—J.C.S.

INDUSTRIAL LEADERSHIP AND JOINT CONSULTATION. A study of Human Relations in Three Merseyside Firms. By W. H. Scott. The University Press of Liverpool. 1952. Pp. 207. 12s. 6d.

This book deserves to be read by anyone concerned with, or interested in, human problems in industry. Its core describes the conduct and results of the author's investigations into the processes of joint Consultation in three Merseyside firms. The very fact that he deals with such a complex subject by making an empirical investigation makes the book an important addition to the too few studies of its kind which are concerned with human relations in the setting of British, rather than American, industry.

After a brief introduction devoted to some theoretical matters on leadership and on the changing pattern of industry, a Chapter I on the background and history of the three firms and a Chapter II on the Analysis and Presentation of the Group Discussion Data, Dr. Scott goes on to present his findings under six heads. These are: The Worker and Joint Consultation; The Worker and his Representative; The Worker, his Supervisor and Management; The Representative, his Supervisor and Management; The Worker and his Fellows; The Worker and his Job. In each of these chapters the data is largely derived from the discussions held with a large number in small groups, throughout the firms. Chapter IX is 'Joint Consultation—an Appraisal.' Then there are six appendices—(A) a copy of the questionnaire used at one stage to check findings; (B) an examination of the value of the group discussion method; (C) a note on the process of change in firm A (written by the Personnel Manager), change partly resulting from Dr. Scott's activities; (D and E) specimen copies of minutes of council meetings in firms B and C respectively, (F) a useful small bibliography.

The method used in the investigation, that of using small discussion groups instead of interviewing individuals has some clear advantages, economy in time used, the effect of the presence of others to provide encouragement in conversation, for example. The results of studies in groups in connection with changing attitudes or for therapeutic purposes suggests that Dr. Scott's use of the technique in industry may be a most valuable introduction.

The findings on joint consultation are clear for these firms. The formal machinery of joint consultation can work adequately only where the atmosphere of informal consultation exists or is encouraged along 'the line.' The trivialities with which works councils tend to deal are real enough for the workers but the fact that many other more important matters are not raised must often be due to the passive attitude management has tended to take—leaving it to employee representatives to present the topics for discussion and taking no initiative or leadership rôle in meetings. Both in formal and in informal consultation, top management sets the pattern with the departmental manager and the foreman as possible key men in spreading the atmosphere. Given the right pattern and satisfactory relationships between firm and Unions, formal joint consultation is both valuable and necessary. Dr. Scott's book raises many suggestions of how to achieve the required pattern.—P. McEWEN.

· HOME ·

Lactic Acid Prices

Bowmans Chemicals Ltd. have announced that the price for lactic acid, dark technical 44 per cent by weight, is now £67 per ton, basis 1-ton lots. Dark chemical quality, 44 per cent by weight, is now £102 per ton, ex works, usual container terms.

Chemical Employment

There was a slight increase in the number of people employed in chemicals and allied trades in Great Britain at the end of August as shown by the industrial analysis in the *Ministry of Labour Gazette*. The total of 477,200 was, however, 12,100 lower than the number employed at the end of 1951.

Fatal Industrial Accidents

No deaths from accidents in the course of employment were reported in chemicals, oils and soap factories in September. The total for the month was 120 compared with 86 in August and a revised figure of 106 for September, 1951. The highest number, 10, occurred in metal conversion and foundry works.

Fire at Chemical Works

Escaping tar from a large cooling tank of pitch which was being tapped caught fire at a chemical works of the National Coal Board at Thrislington Colliery on 6 November. Between 3,000 and 4,000 tons of pitch in two bays over an area of 120 square yards were involved, and 23 fire brigades from all parts of Durham were called out to fight the mass of flames.

I.C.I. & Titanium Production

Work on its three-year research and development programme covering the manufacture of titanium is announced by Imperial Chemical Industries to have reached a stage at which the company can immediately start to erect pilot plants for the production of titanium and its alloys. When these plants are in production they will provide a British source of supply for the development of prototype applications in the engineering and aero engineering fields.

Royal Society President

H.R.H. The Duke of Edinburgh was elected president of the Royal Society of Arts at the inaugural meeting of its 1952-1953 session held in London on 5 November. The office became vacant on the accession of Her Majesty the Queen, who, as Princess Elizabeth, had been president since 1947 and is now patron. The society will complete 200 years of its existence next year.

Spreading Scientific Knowledge

An exhibition to show the value of the technical information services to industry in general and particularly to the smaller industrial concerns was opened in Manchester on 3 November at the Central Library by Mr. A. H. S. Hinchcliffe, of the advisory council of the DSIR. Exhibits by the DSIR included a model of the calorimeter building at the Fuel Research Station.

Titanium Pilot Plants

Imperial Chemical Industries Ltd. has been carrying out a three-year research and development programme covering the manufacture of titanium. The directors have now decided that this work has reached a stage where the company can immediately start to erect pilot plants for the production of wrought titanium and its alloys.

New Director

At a meeting of the board of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, on Monday, MR. N. B. L. WALLACE, D.S.C., was appointed a director of the company. Mr. Wallace was educated at Glasgow High School, and went on to study law at Glasgow University. Before the war he was attached to the Scottish office of Benn Brothers, Ltd., as outside representative. He joined the R.N.V.R. in 1940, was in command of a flotilla of assault landing craft from the early days of Combined Operations, and was awarded the Distinguished Service Cross for operations in Normandy on D-Day. Rejoining Benn Brothers, Ltd., after the war, he became manager of *Industria Britanica*, and a little over a year ago he was appointed manager of *The Hardware Trade Journal*.

PERSONAL

MR. H. D. R. MATTHEWS, M.P.S., F.C.S., who recently resigned from the board of directors of Potter & Clarke, Ltd., has now joined Alwitt Trading Co., Ltd., as manager of the home sales division for pharmaceutical, fine chemicals, crude drugs, essential oils, etc.

Metropolitan-Vickers Electrical Co., Ltd., has announced that on 1 November, MR. W. A. COATES, M.I.E.E., F.Amer.I.E.E., was appointed general sales manager and MR. F. GURNEY, M.I.E.E., was appointed manager home sales. Mr. Coates, who succeeds the late MR. DUNCAN MACARTHUR, retains his seat on the board.

The Lord President of the Council has appointed SIR HUGH BEAVER, M.I.C.E., M.I.Chem.E., managing director of Arthur Guinness, Son & Co., Ltd., to be a member of the Advisory Council for Scientific and Industrial Research. MR. I. A. R. STEDEFORD, chairman of Tube Investments, Ltd., has resigned his membership of the Council because of pressure of other duties.

MR. G. W. SEYMOUR, vice-president of Celanese Corporation of America, has been appointed co-ordinator of process and technical control. In his new position, Mr. Seymour will be responsible for co-ordinating and maintaining liaison among the corporation's three operating divisions—textile, plastic and chemical—and affiliated companies in Canada and Latin America on all matters pertaining to process and technical control.

After 38 years in the service of Harrogate Corporation, MR. ARNOLD WOODMANSEY, Director of Spa Research and Borough Analyst, retired on 8 November. Born in Leeds, Mr. Woodmansey graduated in chemistry at the university there. From 1944 to 1946 he was chairman of the Yorkshire section of the Society of Chemical Industry, of which he was a member for 37 years. He is a Fellow of the Royal Institute of Chemistry and a member of the Chemical Society and the Society of Borough Analysts. He was president of the Harrogate Rotary Club in 1944-45.

The following awards of medals have been made by the president and the council of the Royal Society:—

The Copley Medal to PROFESSOR P. A. M. DIRAC, F.R.S., for his remarkable contributions to relativistic dynamics of a particle in quantum mechanics.

The Rumford Medal to PROFESSOR F. ZERNIKE for his outstanding work in the development of phase contrast microscopy.

The Davy Medal to PROFESSOR ALEXANDER ROBERTSON, F.R.S., for his researches into the chemistry of natural products, particularly the wide range of glycosides, bitter principles and colouring matters containing heterocyclic oxygen atoms.

The Darwin Medal to PROFESSOR J. B. S. HALDANE, F.R.S., for his initiation of the modern phase of study of the evolution of living populations.

The Buchanan Medal to SIR RICKARD CHRISTOPHERS, C.I.E., O.B.E., F.R.S., for his outstanding research on malaria and on the *Anopheles* mosquitos which transmit that disease.

The Sylvester Medal to PROFESSOR A. S. BESICOVITCH, F.R.S., for his outstanding work on almost-periodic functions, the theory of measure and integration and many other topics of theory of functions.

The Hughes Medal to PROFESSOR P. I. DEE, C.B.E., F.R.S., for his distinguished studies on the disintegration of atomic nuclei, particularly those using the Wilson cloud chamber technique.

MR. L. ATHERTON, B.Sc., A.M.I.E.E., has recently joined the Equipment Division of Mullard Ltd., to take charge of the special products commercial group. This group specialises in ultrasonic equipment and laboratory and industrial applications of electronic techniques. Previously, Mr. Atherton was at the Ministry of Supply Atomic Energy Factory, Springfield, Preston, as head of the group concerned with the measurement and control of hazards associated with radioactive materials.

MR. A. E. CRAWFORD, A.R.Ae.S., of the Equipment Division, is now in charge of a special assignment to investigate applications of ultrasonic and other electronic equipment.

• OVERSEAS •

Loan to Aid Expansion

The Norwegian chemical concern Norsk Hydro is to accept a bank loan of £3,750,000 to finance a large-scale increase in production. The company's manufacture of nitrogenous products at Heröya, Rjukan, Notodden, and Glomfjord is to be increased by means of a new electrolytic process, and the production of complete fertiliser, urea, and magnesium is also to be increased. New factories are to be built for producing carbide and phosphor.

Uranium and Sulphuric Acid Project

A sulphuric acid plant is to be built by the Randfontein Estates Gold Mining Company, Witwatersrand, as part of a scheme announced earlier for the production of uranium. By arrangement with the Atomic Energy Board the company will receive a loan estimated at £3,780,000 for the capital cost of the uranium and acid-producing plants and ancillary requirements and also to meet some expenditure underground.

New Fishery Research Laboratories

A new £50,000 building is to replace the present Fishing Industry Research Institute, Cape Town, within three years. The site has been given by the University of Cape Town and provisional plans have been drawn up for two-storey premises containing 20 laboratories and equipment valued at £25,000. Dr. G. M. Dreosti, director of the institute, is expected to visit Europe next year to inspect modern designs in fishery technology laboratories, and to study the latest types of equipment used in research work.

Canadian Market

An increased demand for industrial chemicals finds supplies adequate and most prices firm in Canada. The supply picture on ethylene glycol is good, with retail prices slightly higher than last year for antifreeze purchases. There was a price decline in denaturing alcohol and also in denatured alcohol in tank car lots. The overall acid picture is still directly related to the shortage of sulphur. There is little demand for caustic and chlorine at present. Some coal chemicals in Canada have become temporarily short due to a production slowdown at one of the major steel producing plants. A new oil refinery plant in Western Ontario will add to the supply of chemicals derived from petroleum.

Huge De-asphalting Unit

The Humble Oil & Refining Company has awarded The M. W. Kellogg Company, New York City, petroleum and chemical engineer-contractors, the contract for the design and construction of a solvent de-asphalting plant at Humble's Baytown (Texas) refinery. Said to have twice the capacity of any de-asphalter heretofore designed, the plant will charge 28,000 barrels per day of vacuum reduced crude, providing additional clean feed stock for two recently enlarged fluid catalytic crackers at Baytown. Erection will start as early in 1953 as materials procurement will permit.

Norwegian to Advise Persians

The Norwegian technical consultant, Major Rolf Lowzow, has been appointed technical adviser to the Iranian Government. He states that he expects to be mainly concerned with organising the Iranian Oil Company's storage and transport services, materials control, and accountancy methods. Major Lowzow has been appointed for a 12-month tour of duty by arrangement with the United Nation's Technical Assistance Administration. Major Lowzow says he believes that eight or ten technical specialists are being supplied by the United Nations for similar work in Iran.

Durban Oil Refinery

Operation of the oil refinery now being built by the Standard Vacuum Refining Company at Durban is expected to lead to the development of a number of new local industries based on exploitation of the by-products. South African materials and facilities are being used as far as possible. Installation and maintenance of the instruments needed for refinery operation call for techniques new to the Union and a number of South Africans have been assigned to work in refineries operated by associated companies in Britain and the U.S.A. so that they can obtain the necessary training.

Publications & Announcements

A NEW 'Paraflow' plate type heat exchanger that brings the advantages of all-stainless-steel construction within range of medium capacity duties is announced by the A.P.V. Company, Ltd. The machine is designed to withstand pressures up to 100 lb. per sq. in. which appreciably extends its applications. The design follows the lines evolved by A.P.V., of which the Type H.M. is a familiar example. All its external and liquid-bearing surfaces are of stainless steel. Single-bar tightening is provided and a drop bar allows quick opening and closing. The legs taper to adjustable ball feet to allow easy floor cleaning and installation on uneven floors. The ports are of 2 in. diameter and can be provided with standard British R.J.T. Unions or American I.A.M.S. 3A Unions.

* * *

AIR compressor equipment is of such a kind that the operator can see few results from the working of his machine except readings on a pressure gauge. In order to promote interest and understanding of the principles of his machine and to stimulate skilful handling a new 72-page book on 'Air Compressor Lubrication' has been added to its volume of technical manuals by The Vacuum Oil Company. The theory of air compression, including such questions as the effects of altitude and moisture and the measurement of efficiency are briefly reviewed in a practical manner, the book being intended essentially for the operating and maintenance engineer rather than the designer or manufacturer. Copies may be obtained free on application to the company at Caxton House, Tothill Street, London, S.W.1, or at any of its branches.

* * *

THE wide range of centrifuges, autoclaves, microtomes and homogenisers available from Measuring and Scientific Equipment, Ltd., is shown in a new General Manufacturing Programme Leaflet (No. 888), recently issued, which serves as an introduction to these laboratory products of the company. Individual leaflets giving more detailed information on particular items, may be obtained from the company at 14 Spenser Street, London, S.W.1.

THE 'SLONSAL' carboy truck is the latest product of Williams and Dickenson (London) Ltd. This is a small hand-operated truck with two wheels, its principle being that of a railway porter's luggage trolley. The truck has a sole plate on to which the carboy is slid, and two long handles connected by curved back bars to prevent the carboy rolling about. A clip secures the bar of the carboy cage to the back bar. The truck, say the company, will also handle drums, containers, Winchester crates, and bagged chemicals equally well. It is strong, but not heavy, and is mounted on 8 in. rubber tyred wheels. The price is £6 18s., carriage paid.

* * *

A NEW jointing compound manufactured by Richard Klinger, Ltd., Klingerit Works, Sidcup, Kent, England, is said to increase the tightness and life of metal gaskets and completely replace gaskets of secondary importance. It can be used successfully on its own, instead of paper, oiled paper, and similar materials, and is said to withstand pressures up to 100 atmospheres and temperatures up to 300°C. It is also said to be non-inflammable, resilience-retaining, resistant against diluted acids, alkaline solutions, alcohol, aliphatic hydrocarbons, ammonia, benzine, carbon oxide gases, chlorine, coal gas, esters, ether, hydrogen, ketones, natural gas, nitrogen, oils, oxygen, petroleum, etc.

* * *

FATS, solid or liquid, which constitute considerable proportions of many seeds and of the external coatings of some fruits are important raw materials. They are built up from a wide range of long-chain, mainly unsaturated fatty acids. Their chemical constitution and the marked tendency of related plant species to elaborate similar mixtures of specific fatty acids in their seed glycerides are discussed by Dr. T. P. Hilditch in the current issue of *Endeavour* (Vol. XI, No. 44). A number of interesting points are raised in an editorial on 'Science and the Daily Press' and other articles include: 'The Mode of Action of Hereditary Factors' by Dr. A. Butenandt and 'Nucleoproteins and Cell Division' by Dr. W. Jacobson and Dr. M. Webb, which is illustrated by colour plates.

A BOOKLET on magnetic alloys has been prepared by the Westinghouse Electric Corporation, of America, and can be obtained under the reference TD-52-100, Box 2099, Pittsburgh 30, Pa. The various alloys that are covered in the booklet include 'Hipernik,' 'Hipernik V,' 'Conperic,' and 'Hiperco.' The first three materials mentioned are iron-nickel alloys while the last is iron cobalt alloy. These materials provide a wide range of magnetic properties for many special requirements. Physical and magnetic property tables together with the availability of each alloy are included. These are accompanied by a discussion of individual alloy heat treatment techniques. The inclusion of 15 core loss and magnetisation curves makes the booklet especially valuable when matching the correct alloy with a specific application.

* * *

RUST—what it is and what it costs—and the means of overcoming it are explained in an illustrated booklet 'The Fight Against Rust' (2s. 6d.), which describes the work of the Corrosion Committee of the British Iron and Steel Research Association. To illustrate the serious damage that may occur through rust, unless adequate preventive measures are taken, seven examples are given, four of corrosion by air, two by water, and one by soil. Systematic tests at exposure stations throughout the world with conclusions from them, and the work on protective coatings and methods of testing are described in the section on applied research. The importance of fundamental research in elucidating the reasons for rusting and in suggesting better methods of prevention is illustrated by the work of Dr. U. R. Evans and his colleagues at Cambridge University, and Dr. W. H. J. Vernon and his staff at the Chemical Research Laboratory, Teddington. The Corrosion Committee, which was formed in 1928, will celebrate its jubilee next year. It became part of the B.I.S.R.A. when the association was formed in 1945.

* * *

CORROSION Limited announce the introduction of 'Glopane Wet,' a new type of their 'Glopane' Cold Galvanising, specially designed for application to wet iron or steel surfaces, or even under water. Prolonged laboratory and practical tests, says the company, have ensured that this coating has all the corrosion-resistant properties for which zinc-rich paints are now well-known. Its introduction is said to be of importance to the building and constructional industries as regards both initial protection and in maintenance work. Specialised applications where it is claimed to have invaluable properties are places such as iron and steel structures in tidal waters, ships' topsides and superstructures, chemical works, and other places where it is not normally possible to secure a dry surface. It is normally necessary to wait a long time after wet weather to let the water dry off, but 'Glopane Wet' is claimed to be applicable immediately rain stops, and even, if necessary, while rain is actually falling. This should save much time, says the company.

* * *

TWO booklets of value to those interested in fatty acid derivatives are available from the Chemical Division of Armour and Company, Ltd., London E.C.1. One of these 'The Chemistry of Fatty Acids' describes a number of reactions of fatty acids such as hydrogenation, sulphonation, and sulphation; the production of acid anhydrides, nitriles, amines, amides, and so on. The amides are dealt with in more detail in the second booklet entitled 'Armids' which gives a table of the whole range of aliphatic amides produced by Armour and Co., together with their main properties which include that of being highly water-repellent.

* * *

HAZARDS of handling sulphuric acid are, of course, generally appreciated but it is neverthless important that the recommended practices should be kept under review and revised from time to time. A new edition of its manual on methods of unloading sulphuric acids from tank cars (Sheet TC-1), has just been issued by the Manufacturing Chemists' Association, Inc., U.S.A.. Recommendations for unloading congealed sulphuric acid and oleum have been broadened to cover a wider range of conditions consistent with modern practice. Other sections of the manual cover safety equipment, unloading equipment, sampling procedure, what to do in the case of leaks, use of compressed air, unloading technique, and proper handling and care of the tank car. The manual (12 pp.) is one of a series on the safe handling of common industrial chemicals issued by the Manufacturing Chemists' Association, and may be obtained from its headquarters at 246 Woodward Building, Washington, D.C. (20 cents, post paid).

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

FOX CHEMICAL ENGINEERING WORKS, LTD., London, N.W. (M., 8/11/52). 7 October, by order on terms, £1,400 charge, to Stevedore Properties, Ltd.; charged on land and buildings, at Maybury Gardens, Willesden. *£2,882. 17 January, 1952.

Satisfaction

CHEMICAL ENGINEERING & WILTONS, LTD. (formerly Chemical Engineering & Wilton's Patent Furnace Co., Ltd.), Horsham. (M.S., 8/11/52). Satisfactions, 10 October, of first debenture registered 29 August, 1917, of mortgage registered 19 March, 1936, and of debenture registered 19 October, 1938.

Increases of Capital

The following increase of capital has been announced: MAY & BAKER LTD., from £662,500 to £1,287,500; PAUL WORMSER & CO., LTD., from £100 to £3,000; RUTIN PRODUCT, LTD., from £100 to £1,100.

Changes of Name

The following change of name has been announced: General Anti-Corrosive Constructions, Ltd., to ANCHORITE, LTD.

Receiverships

The following have ceased to act as Receivers: Eric C. Smith, 17 Todd Street, Manchester 3, of ORGANIC DYESTUFFS, LTD.

Wm. A. Whitehead, 123/125 Clayton Street, Newcastleon-Tyne 1, of ESCADE, LTD.

A. Waterhouse, Delaheys House, Delaheys Road, Hale, Cheshire, and J. E. Wooley, Lee Mount, Marple Road, Charlesworth, Cheshire, of WINDMILL RUBBER & CHEMICAL CO., LTD.

New Registrations

Agricola Plant Protecting Chemicals, Ltd.

Private company. (511,726). Capital £5,000. Manufacturers of plant protecting chemicals, etc. Directors: L. Hearst and A. Hearst. Reg. office: 8 Park Street, W.1.

Enthoven Solvents Ltd.

The formation of a new company to be known as Enthoven Solvents, Ltd., has been announced by H. J. Enthoven & Sons, Ltd., refiners and manufacturers of non-ferrous metals. The new company, operative from 15 October, will take over the marketing and development of all solder and solder specialities. Enthoven Solvents, Ltd., is located at Enthoven House, 89 Upper Thames Street, London, E.C.4.

Ergol Photochemical Research Ltd.

Private company. (512,560). Capital £3,000. Manufacturing, research, dispensing and analytical chemists. Directors: J. F. S. Higham. Reg. office: 54 Fleet Street, E.C.4.

Polymer Consultants Ltd.

Private company. (512,239). Capital £2,000. Consultants and advisers on all matters connected with the study of Polymerisation Chemistry. Directors: A. D. Whitehead, and P. Muscatt, 111 Ashford Court, Ashford Road, N.W.2.

Rylatt's Colours, Ltd.

Private company. (511,901). Capital £1,000. Manufacturers of chemicals, colours, and dyestuffs. Director: Mrs. R. H. Ryelatt, Reg. office: Candas, Bryn y bia Road, Craigside, Llandudno.

Smith & Nephew Research Ltd.

Private company. (512,409). Capital £25,000. Organise, promote and carry on scientific and industrial research (chemical and pharmaceutical substances). Directors: L. F. Long, F. G. Moore and E. Robinson. Reg. office: 42 Tavistock Square, W.C.1.

Textile Dyestuffs & Chemicals (Brighouse) Ltd.

Private company. (512,679). Capital £5,000. Chemical manufacturers and drysalters, indigo merchants, etc. First directors to be appointed by the subscribers. Reg. office: Princess Street, Birds Royd, Brighouse.

Next Week's Events

MONDAY, 17 NOVEMBER

Society of Chemical Industry

Leeds: University, 7 p.m. Joint meeting of the Yorkshire Section with the Road and Building Materials Group. Dr. A. C. Whiffin and W. J. J. Price: 'Road Problems Arising from Snow and Ice.'

The Chemical Society

Cardiff: University College, 5.30 p.m. Professor H. W. Melville: 'Some Recent Developments in the Investigation of Radical Reactions.'

Incorporated Plant Engineers

Liverpool: Radiant House, Bold Street, 7.15 p.m. Colonel R. W. W. Taylor: 'Pneumatic Control in Industry.'

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. First of three Cantor Lectures by Dr. P. W. Brian (Imperial Chemical Industries, Ltd.) on 'Microbiology.'

TUESDAY, 18 NOVEMBER

Society of Chemical Industry

London: Royal College of Science, South Kensington, S.W.7, 2.30 p.m. Agriculture Group. Dr. J. J. Lehr (director, Plant Nutrition Research Laboratory of the Chilean Nitrate Agricultural Service, Wageningen, Holland): 'Sodium as a Plant Food.'

Royal Institute of Chemistry

Bolton: Technical College, 7 p.m. H. R. Leech (I.C.I. Ltd., General Chemicals Division): 'Production and Properties of Fluorine.'

London: Battersea Polytechnic, S.W.11, 7 p.m. Dr. H. J. Barber: 'The Organic Chemist in Industry.'

Hull Chemical & Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. J. E. L. Thomas: '"Ardil" Protein Fibre.'

Institute of Petroleum

Manchester: Engineers' Club, Albert Square 6.30 p.m. Symposium on the Filling, Packaging and Handling of Petroleum Products.

Incorporated Plant Engineers

St. Albans: Peahen Hotel, 7.30 p.m. Hertfordshire Discussion Group: 'Plant Repair by Welding.'

Institute of Metals

Sheffield: Grand Hotel, 7 p.m., with Sheffield Metallurgical Association. Major P. L. Teed: 'Some Metallurgical Problems Imposed by Stratospheric Flight.'

North East Metallurgical Society

Middlesbrough: Cleveland Scientific and Technical Institution, 7.15 p.m. H. T. Shirley: 'Micro-Structural Characteristics of Corrosion in Acid-Resisting Steels.'

WEDNESDAY, 19 NOVEMBER

Society of Chemical Industry

Newcastle: King's College, 6.30 p.m. Professor W. Wardlaw: 'Researches on Some Group IV Elements.'

Royal Institute of Chemistry

London: University College, Gower Street, W.C.1, 6.30 p.m. Annual general meeting of the London and South-Eastern Counties Section, followed by an address by the president, H. W. Cremer, on: 'Theory and Practice.'

Institution of Chemical Engineers

Birmingham: University, Edmund Street, 6.30 p.m. Midlands Centre, Graduates' and Students' Section. Dr. W. S. Norman opens discussion on 'The Home Paper Examination.'

The Fertiliser Society

London: 26 Portland Place, W.1, 2.30 p.m. E. G. Lawford (Rio Tinto Co. Ltd.): 'The Mining and Preparation of Pyrites for Acid Making.'

Incorporated Plant Engineers

London: Afternoon visit to works of the Morgan Crucible Co., S.W.11.

Rochester: Bull Hotel, 7 p.m. Kent Branch. A. V. Driver (Shell-Mex and B.P. Ltd.): 'Can Additives in Lubricating Oil Help the Plant Engineer?'

Institute of Metals

London: Royal Institution, Albemarle Street, W.1, 9.45 a.m. All-day symposium on 'The Properties of Metallic Surfaces.'

THURSDAY, 20 NOVEMBER

Society of Chemical Industry

Bristol: University, Woodland Road, 7 p.m. Joint meeting of the Bristol Section with the Chemical Society and the RIC. Dr. W. J. Arrol: 'Pile-produced Isotopes.'

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park S.W.1, 9.45 a.m.-5 p.m. Symposium on: 'Caustic Cracking in Steam Boilers.' Speakers include: Dr. A. A. Berks (U.S.A.); Dr. J. Lodder (Holland); and Dr. R. Rath (France).

[continued on page 684

952

blems

y
c and
H. T.
ics of

p.m.
es on

Street,
neeting
ounties
y the
y and

rs
Street,
es' and
opens
amina-

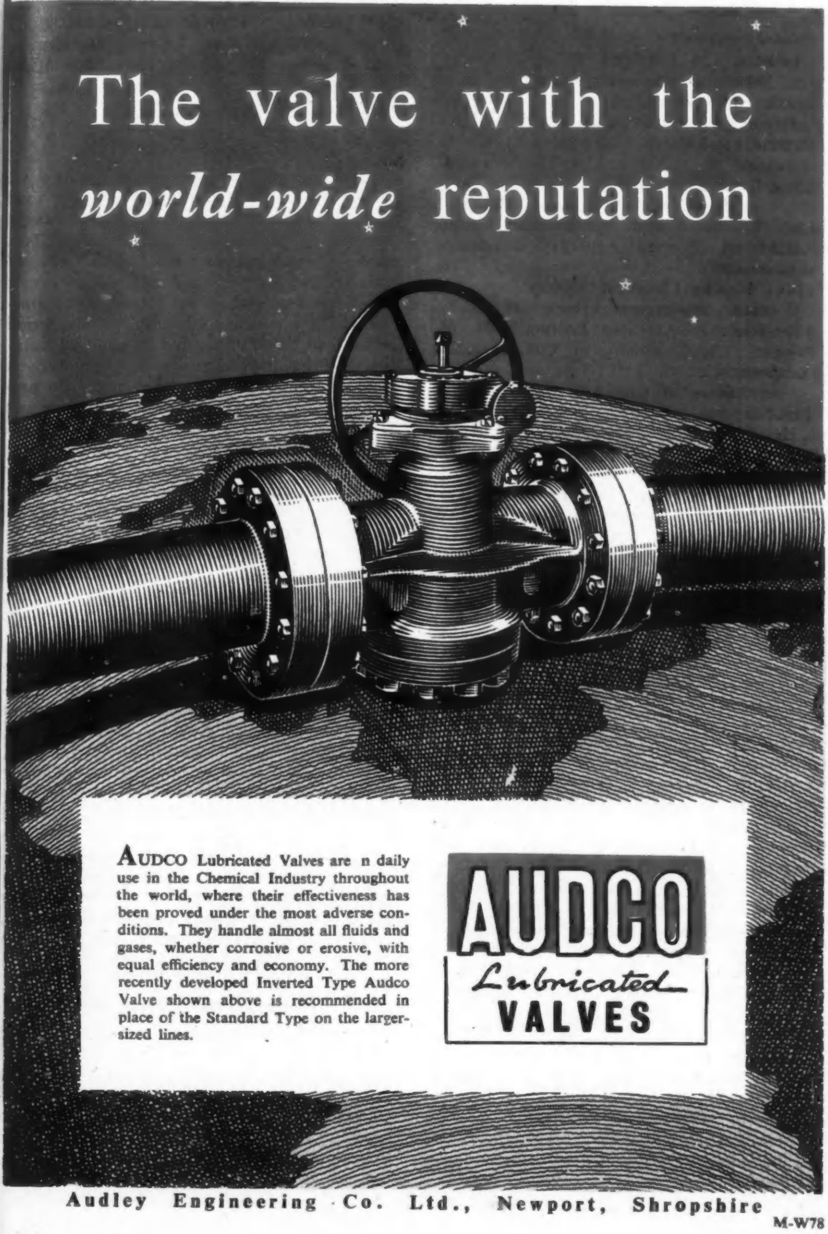
0 p.m.
'The
r Acid

of the

Kent
nd B.P.
ng Oil

bemarle
posium
aces.'

oad, 7
Section
e RIC.
otopes.'
l Engi-
S.W.1,
Caustic
ters in-
Dr. J.
France).
page 684


The valve with the *world-wide* reputation
AUDCO Lubricated Valves are n daily use in the Chemical Industry throughout the world, where their effectiveness has been proved under the most adverse conditions. They handle almost all fluids and gases, whether corrosive or erosive, with equal efficiency and economy. The more recently developed Inverted Type Audco Valve shown above is recommended in place of the Standard Type on the larger-sized lines.
AUDCO
Lubricated
VALVES
Audley Engineering Co. Ltd., Newport, Shropshire
M-W78

Next Week's Events

continued from page 682]

London: 26 Portland Place, W.1, 6.15 p.m. Microbiology Group, joint discussion meeting with the Food Group. 'Technical Problems Associated with Microbiological Standards for Foods,' introduced by Dr. M. Ingram.

London: The Building Centre, Store Street, Tottenham Court Road, W.C.1, 6 p.m. Road and Building Materials Group. F. E. Jones: 'Cement Aggregate Interaction in Concrete.'

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. Tilden Lecture. H. M. Powell: 'The Chemistry of Intermolecular Compounds.'

Institution of Chemical Engineers

Huddersfield: Technical College, 7 p.m. S. Hesling: 'Some Recent Developments and Applications of the Fluidised Solid Technique.'

The Royal Institution

London: 21 Albemarle Street, W.1, 5.15 p.m. First of three lectures by Dr. D. H. R. Barton (Reader in Organic Chemistry, Birkbeck College, University of London): 'The Chemistry of the Steroids.'

FRIDAY, 21 NOVEMBER

The Chemical Society

Dublin: Trinity College, 7.45 p.m. Joint meeting with the Werner Society. Professor M. J. S. Dewar: 'The Molecular-orbital Theory of Organic Chemistry.'

Glasgow: University, 7.15 p.m. Dr. J. S. Anderson: 'Some Recent Work on the Chemistry of Metallic Oxides.'

Southampton: University, 5 p.m. Joint meeting with RIC. Dr. J. Chatt: 'The Nature of the Co-ordinate Link.'

Swansea: University College, 5.30 p.m. Lecture by Professor R. P. Linstead.

Institution of Chemical Engineers

Chester: Queen's Hotel, City Road, 7 p.m. North West Centre, Graduates' and Students' Section. S. A. Gregory: 'Problems of Plant Design for Fluidised Processes.'

Newcastle-on-Tyne: Stephenson Building, Claremont Road, 6.15 p.m. North East Centre, Graduates' and Students' Section. Professor Shelby-Miller: 'Filtration.'

Institute of Physics

Manchester: University, 6.45 p.m. Dr. E. J. Bower (Oxford University): 'Fluorescence.'

Society of Dyers & Colourists

Manchester: College of Technology, 7 p.m. Ladies' evening. Lectures and demonstrations on the miscellaneous applications of dyestuffs.

Market Reports

LONDON.—Conditions were again unaltered on the chemicals market with deliveries to the chief consuming industries continuing to cover fair quantities. New business both on home and export account was in the main limited to spot or nearby requirements, and it was felt in some quarters that a more confident outlook would soon lead to an expansion in contract bookings. Price movements were comparatively few and generally concerned with the non-ferrous metal compounds. Lithopone was quoted lower at £58 10s. per ton for the standard material and at £91 15s. per ton for the 60 per cent grade. After a number of fluctuations the latest price for dry white lead was £142 10s. and for dry red lead and litharge £126 15s. per ton. Quotations for zinc oxides, per ton, were: Red seal £136; Green seal £137 10s.; and White seal £138 10s. Demand for coal tar products continued quiet, with no price changes.

MANCHESTER.—Improved conditions in the cotton and woollen textile industries made for a rather better demand for bleaching, dyeing and finishing chemicals during the past week, though these sections as well as some other using industries were still taking below their normal qauntities. With an odd exception prices for leading lines maintained a steady front. In basic slag and one or two other sections of the fertiliser market a steady trade was reported. There has been little change in the position of the tar products market. New bookings were relatively quiet, but, on the whole, existing contracts were being steadily drawn against.

Norway's Heavy Water Supply

Heavy water has been produced by the Norsk Hydro, one of Norway's largest chemical concerns, since 1934. Beginning with deliveries for experiments to laboratories all over the world, heavy water in considerable quantities for uranium reactors has, since the war, been delivered to Britain, France, Norway and Sweden.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

ASSISTANT ENGINEER required by Chemical Engineering Firm in London. Qualifications required are: Age up to 30; B.Sc., or equivalent; good knowledge of physics and heat transfer essential; good mathematics; understanding of chemistry desirable; practical Works' experience essential; understanding of general Office procedure and technical sales an advantage. The position offers excellent opportunities to a man having these qualifications coupled with a keen business outlook. Write stating age, qualifications, salary required to **BOX NO. C.A. 3181. THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.**

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by competitive interview during 1952.

The Posts are divided between following main groups and subjects (a) Mathematical and Physical Sciences, (b) Chemistry and Metallurgy, (c) Biological Sciences (Mycological research, Biological research, Insect control and Bacteriology) to a total of eight posts, (d) Engineering subjects and (e) Miscellaneous (including e.g. Geology, Library and Technical Information Services).

Age Limits: For Experimental Officers, at least 26 and under 31 on 31st December, 1952; for Assistant Experimental Officers at least 18 and under 28 on 31st December, 1952. Extension for regular service in H.M. Forces.

Candidates must have obtained, or be taking examinations during 1952 with a view to obtaining, the Higher School Certificate with mathematics or a science subject as a principal subject, or the General Certificate of Education in appropriate subjects, or the Higher National Certificate or other specified qualifications. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Candidates over 20 will generally be expected to have higher qualifications.

Inclusive London salary scales :—

Experimental Officer £628—£786 (men); £533—£655 (women).

Assistant Experimental Officers £274—£586 (men); £274—£490 (women).

Starting pay according to age up to 26. At 18, £274; at 26, £495 (men), £467 (women). Somewhat lower rates in the provinces.

Further particulars and application forms from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S.94-95/52. Completed application forms should be returned as soon as possible. 19447/40/EGS.

THE POWER-GAS CORPORATION LTD., STOCKTON-ON-TEES requires **HONOURS PHYSICAL CHEMIST,** age 25-35. Duties will include Laboratory Work, also Basic Design of Chemical Plant. Permanent position, good prospects. Apply stating age, experience, etc.

THE POWER-GAS CORPORATION LTD., STOCKTON-ON-TEES requires two **GAS/CHEMICAL ENGINEERS.** Work will be mainly in connection with the basic design of Gas and Chemicals Plant. Permanent position, good prospects. Apply stating age, qualifications, etc.

SITUATIONS VACANT

METALLURGISTS Qualified men required in the following categories by important Manufacturing Engineers located in outer East London. Maximum age, 40.

(1) Man aged not less than 25, having recent practical experience in Metallography. Should have made some special study of this topic.

(2) Man aged not less than 22, having not less than one year's general laboratory experience and a practical knowledge of Foundry technique.

Salary in accordance with experience and qualifications. Generous Pension Scheme. Reply to **BOX No. C.A.3180, THE CHEMICAL AGE,** 154, Fleet Street, London, **E.C.4. Quoting Ref. AMC.**

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS; PATENT EXAMINER AND PATENT OFFICER CLASSES. The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by competitive interview during 1952. The Scientific posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of fundamental and applied science. The patent posts are in the Patent Office (Board of Trade), Admiralty and Ministry of Supply.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in Mathematics, or an equivalent qualification; or for Scientific posts, possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience.

Age Limits: Senior Scientific Officers, between 26 and 31; for Scientific Officers and Patent Classes, between 21 and 28 during 1952 (up to 31 for permanent members of the Experimental Officer class competing as Scientific Officers). London Salary Scales; Senior Scientific Officers (men) £812—£1,022; (women £681—£917; Scientific Officers (men) £440—£707; (women) £440—£576; Patent Examiner and Patent Officer Classes (men) £440—£655. (Rates for women under review). Somewhat lower rates in the provinces.

Further particulars from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S.53/52 for Senior Scientific Officers and S.52/52 S.128/52 for the other posts. 19147/40/SD.

FOR SALE

A NUMBER of FODEN 6 by 4 Diesel engined, Rear **DUMP WAGONS,** Heavy Duty, fast tipping, Capacity 9 cu. yds. Suitable for moving bulk materials, located N. Midlands, prices vary around £2,000 each. **TARSLAG ROTHERHAM 3235.**

CHARCOAL, ANIMAL AND VEGETABLE, horticultural, burning filtering, disinfecting, medicinal-insulating; also lumps ground and granulated; established 1830, contractors to H.M. Government.—**THOS. HILL-JONES LTD., "INVICTA" MILLS, BOW COMMON LANE LONDON, E TELEGRAMS: "HILL-JONES, BOCHURCH LONDON," TELEPHONE 3285 EAST.**

DRAGON HEAT MACHINES make an adaptable Portable Forge and are used extensively in boilers in conjunction with solid fuel to raise steam quickly. Excellent for heating metal, removing rust, etc. Two gallons paraffin gives two hours' burning. 2,000 deg. flame temperature. No instruction necessary. Perfectly safe. Full descriptive literature from **MORTON LONGLEY, LIMITED, 200, THE BEACON, HILLINGDON, MIDDX.**

FOR SALE

600

CHEMICAL PLANT

LABOUR **CENTRIFUGAL PUMP,** size O, No. 50 MW. Capacity, 65 gals. per min. Sulphuric acid, 80/85 per cent strength. All contact parts fabricated in lead (regulus metal). Motorised, 400/3/50.

Selas Type 9 **GAS AND AIR MIXING MACHINE,** comprising gas inlet governor, air and gas proportioning valve with vernier adjustment, back pressure valve, booster unit, and delivery pressure controller. Maximum capacity, 25,000 cu. ft. per hour. Air/gas mixture at adjustable delivery pressure.

De-airing type **PUG MILL** by Bonnot. Primary chamber, 4 in. diam.; secondary worm extruder, 3 in. diam.; 3 in. discharge with 7½ in. by 9 in. opening. Of aluminium construction with stainless steel shaft and worms. Motorised, 220/440/3/50.

SIFTER MIXER by Young, with trough, 70 in. by 26 in. by 26 in. deep. Blending chamber feeds material to positive action brush sifter in trough screen. Broken scroll agitator. Pulley drive.

Horizontal **MIXER,** single trough, 4 ft. by 1 ft. 9 in. by 2 ft. 4 in. deep. "Z"-type agitator. Pulley drive. Arranged hand tilting.

Baker Perkins **TROUGH TILTING MIXER.** Alloy trough, 20 in. by 14 in. by 17 in. deep, with cover. Gunmetal gate-type agitators. Fast and loose pulley drive.

48 in. diam. Underdriven **HYDRO EXTRACTOR** by Thomas Broadbent, with mild steel galvanised basket 48 in. diam. by 25¼ in. deep, with ⅛ in. perforations at 1¼ in. pitch. Open-type machine, 3-point suspension. Motorised, 400/3/50.

Cast-iron Plate and Frame **FILTER PRESS,** 32 plates for cakes 36 in. sq., 1 $\frac{3}{16}$ in. thick. 3-in. flanged bottom outlet. Hand-operated closing.

Two Unused Johnson Wooden Plate and Frame **FILTER PRESS CARCASSES.** Hydraulic closing gear. Frame size, 61 in. by 49 in. Cake size, 48 in. by 38 in. by 2$\frac{15}{16}$ in. Suitable for 28 chambers. Rubber-lined filtrate trough.

New 50-gal. Stainless Steel Tilting-type **BOILING PANS** in F.D.P. material. 80 p.s.i. w.p.

New ½ h.p. 400/3/50 **SLOW-SPEED STIRRERS.** Stainless steel shaft 5 ft. long, at 420 r.p.m.

GEORGE COHEN SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Tel. Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel. Pudsey 2241.

COLES THORNYCROFT CRANE, Mark VII, Series 7, little used. **BOX NO. C.A. 3179,** THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

GRAVITY Roller Conveyor several lengths, Rolls. 2¼ in. diam. by 16 in 3 in. centres. Good condition. **THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET MILLWALL E.14.** (Tel. . East 1844.)

SCREENLESS PULVERIZERS for fine grinding of Chemicals. Also **CYCLONES, ROTARY VALVE FEEDERS.** Callow (Engrs.) Ltd. Kirkby Trading Est., Liverpool.

PHONE 98 STAINES

12,000 gallon Welded Cylindrical Enclosed **TANKS,** 30 ft. by 9 ft.

4,000 gallon Welded (Unused) **TANKS,** 15 ft. by 7 ft. by 7 ft.

1,000 gallon Welded Petrol **TANKS** (two).

3,000 gallon **"BRAITHWAITE" SECTIONAL,** 12 ft. by 10 ft. by 4 ft.

1,250 gallon Welded 2-compartment **VEHICLE TANK.**

BOILERS, PUMPS, STILLS, CONDENSERS, HYDROS, AUTOCLAVES, MIXERS, PANS, CONVEYORS, OVENS, DRYERS, ETC.

Send for lists.

HARRY H. GARDAM & CO., LTD.
STAINES.

FOR SALE

IMMEDIATE DELIVERY

NEW STANDARD

CAST-IRON FLANGED PIPING

78	lengths,	5 in.	diam.	9 ft.
43	,,	5 in.	,,	6 ft.
58	,,	5 in.	,,	5 ft.
52	,,	10 in.	,,	12 ft.
72	,,	10 in.	,,	9 ft.
15	,,	10 in.	,,	6 ft.
535	,,	12 in.	,,	12 ft.
367	,,	12 in.	,,	9 ft.
75	,,	12 in.	,,	6 ft.
71	,,	12 in.	,,	5 ft.

LARGE QUANTITY SHORTER LENGTHS

ALSO

STANDARD BENDS, TEES AND FITTINGS

Inspection by arrangement.

MADEN & McKEE, LTD.,
317, PRESCOT ROAD,
LIVERPOOL, 13.

ECONOMIC BOILERS—9 ft. diam. by 12 ft. 6 in. Foster Yates, 200 lb. w.p.; 8 ft. diam. by 14 ft. Paxman, 180 lb. w.p.

NEW GALVANISED PIPING. Immediate delivery. Johnson Filter **PRESSES,** 25 in., 18 Frame, practically new.

FIVE new **FURNACE RETORTS,** 8 ft. diam., 6 ft. 8 in. deep, approx. 8 tons each. Welded Steel.

BENZOLE WASHER, lead lined, agitating gear, 7 ft diam., 6 ft. 6 in. deep.

FIVE Dish-ended **NAPHTHA TANKS,** 18 ft. 6 in. long by 4 ft. 4 in. diam.. two having agitators.

NINE New Welded **TANKS,** 13 ft. 6 in. long, 7 ft. diam., 3,100 gallons each.

TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.** Stainless Steel **FILTER TANK,** 3 ft. 6 in. diam.

ONE Stainless **CONICAL HOPPER,** 7 ft. 3 in. diam., overall depth, 7 ft. 6 in.

TWO Broadbent **WATER-DRIVEN CENTRIFUGES,** 30 in. diam., 12 in. deep, 1,150 r.p.m., 150 lb. pressure.

FOUR Papier-mache O.T. **TANKS,** 8 ft. 3 in. diam., 9 ft. deep. (Unused.)

SIX O.T. **TANKS,** 7 ft. diam. 14ft. deep, lined inside with acid-resisting bricks.

SIX Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, ⅞ in. o.d.

FOUR Rectangular Lead-lined **TANKS,** 8 ft. by 4 ft. 6 in. by 2 ft. 6 in.

FORTY Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lbs. w.p.

CAST-IRON PIPES, 5000 ft. Each 6 in. and 8 in.

VALVES in Stainless, Gunmetal, Enamel Lined.

Free Catalogue, "Watkins Machinery Record," available.

FRED WATKINS, COLEFORD, GLOS.

30 **CWT. CHAIN BLOCKS,** 10 ft.-12 ft. lift, ex-Government surplus. £15 per set.

5 **CAST-IRON JACKETED PANS,** 36 in. diam. by 27 in. deep, 1½ in. bottom outlet. £20 each.

1 **MILD STEEL WELDED OPEN-TOP TANK,** 60 in. by 27 in. by 42 in. by ⅜ in. plate. £25.

THOMPSON & SON (MILLWALL), LTD.,
CUBA STREET, MILLWALL, E.14.
TEL. EAST 1844.

PATENTS & TRADE MARKS

KING'S PATENT AGENCY, LTD. (B. T. King, A.M.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free Phone: City 6161.

SERVICING

CRUSHING, GRINDING, MIXING and DRYING for the trade.

THE CRACK PULVERISING MILLS, LTD.
Plantation House,
Mincing Lane,
London E.C.3.

CRUSHING, MILLING, PULVERIZING, BLENDING, SIFTING, DRYING OF FINE CHEMICALS. Capacity available for work where maximum purity is the main consideration. Modern high-class equipment and full technical control.
Inquires to: T. E. I. POWDER PROCESS DEPT., 146, GREAT CAMBRIDGE ROAD, ENFIELD.

DOHM, LTD., have 14 factories for pulverising grinding, mixing and drying raw materials. Trade inquiries to Dohm, Ltd., 167, Victoria Street, London. S.W.1. (VIC. 1414.)

GLASSBLOWING by HALL DRYSDALE & CO. LTD., 58, COMMERCE ROAD, LONDON, N.22. Telephone: BOWes Park 7221.)

GRINDING of every description of chemical and other materials for the trade with improved mills. THOS HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON. E. TELEGRAMS: "HILL-JONES, BOCHURCH, LONDON" TELEPHONE: 3285 EAST.

WANTED

INDUSTRIAL BY-PRODUCTS, LTD., 16, Philpot Lane, London, E.C.3, will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

WORKING NOTICES

THE Proprietor of British Patent No. 570,519, entitled "PRODUCTION OF BUTYL ALCOHOL AND ACETONE BY FERMENTATION," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to SINGER, STERN & CARLBERG, 14, EAST JACKSON BOULEVARD, CHICAGO 4, ILLINOIS, U.S.A.

IT is desired to secure the full commercial development in the United Kingdom of BRITISH PATENT No. 612,440 which relates to "HYDROCARBON WAX COMPOSITIONS," either by way of the grant of licences or otherwise, on terms acceptable to the Patentee. Interested parties desiring copies of the patent specifications should apply to STEVENS, LANGNER, PARRY & ROLLINSON, 5 to 9, QUALITY COURT, CHANCERY LANE, LONDON, W.C.2

IT is desired to secure the full commercial development in the United Kingdom of BRITISH PATENTS Nos. 593,678 and 605,442, which relate to "MANUFACTURE AND USE OF GERMICIDAL COMPOUNDS" "PREPARATION OF DIARYL MERCURY COMPOUNDS," either by way of the grant of licences or otherwise, on terms acceptable to the Patentee. Interested parties desiring copies of the patent specifications should apply to STEVENS, LANGNER, PARRY & ROLLINSON, 5 to 9, QUALITY COURT, CHANCERY LANE, LONDON, W.C.2.

Printed in Great Britain by THE PRESS AT COOMBELANDS Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 15 November, 1952. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.